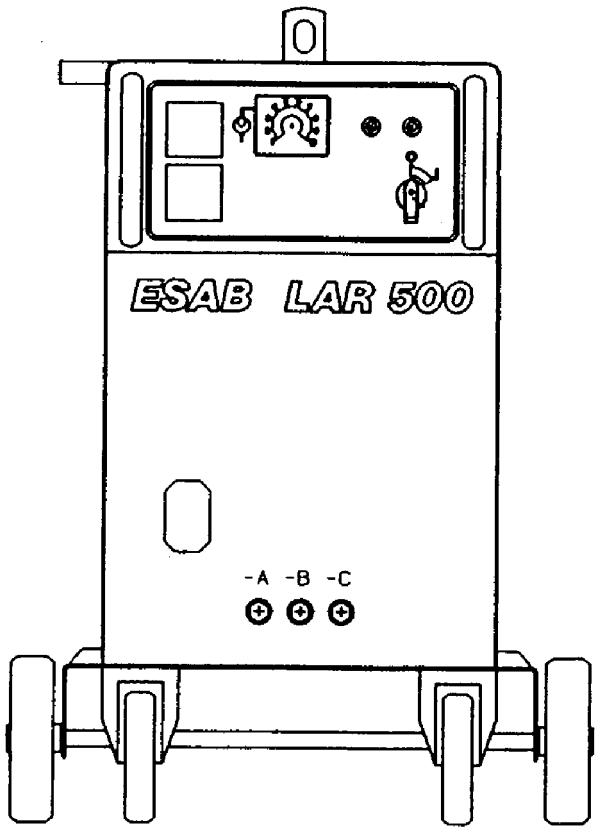
LAR 500/630
LAR Magma



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Service manual

0740 800 019 020923

Valid for serial no. 024-xxx-xxxx to 535-xxx-xxxx

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INTRODUCTION

Maintenance and repair work should be performed by an experienced person, and electrical work only by a trained electrician. Use only recommended replacement parts.

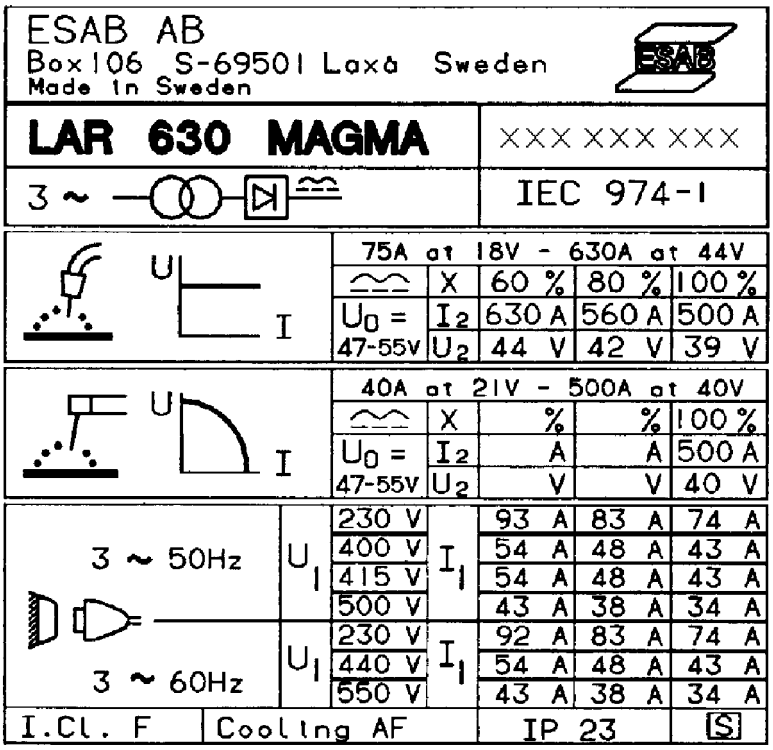
This service manual is intended for use by technicians with electrical/electronic training for help in connection with fault-tracing and repair.

This manual contains details of all design changes that have been made up to and including August 2002.

The LAR 500/630 and LAR 500/630 Magma are designed and tested in accordance with international and European standard IEC/EN 60974-1 and EN 50199.
On completion of service or repair work, it is the responsibility of the person(s) etc. performing the work to ensure that the product does not depart from the requirements of the above standard.

RATING PLATE

The rating plate is secured to the rear of the machine. The following points describe what the various items on it mean.



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LAN 630 is the type designation for the Welding machine. The first letter, L, indicates that LAR is a rectifier, while A indicates that the power unit is designed for semi-automatic welding and R indicates the design generation.
The numerals 630 indicate the maximum welding current.

1 These symbols indicate that the LAR 630 comprises a transformer and a rectifier.

2 Indicates the voltage/current characteristic for MIG/MAG welding.

3 Indicates the voltage/current characteristic for MMA welding.

4 Indicates that the unit is intended for connection to a three-phase 50/60 Hz supply.

5 The machine's serial number, consisting of three groups of figures.
The first group (xxx) indicates the version. The numerals indicate the year and week of approval of the design version.
The second group (yyy) indicates the year and week of the machine's final testing: e.g. 305 indicates 1993, week 5.
The final (zzz) group consists of three or four numerals and is a consecutive serial number from 0001 to 9999.

6 Shows that ESAB complies with the international IEC 974-1 standard.

7 X = The intermittence factor, i.e. the length of time for which welding can be performed at the specified welding data, expressed as a percentage of a ten-minute period.

I_2 = Current at the respective intermittence factor.

U_2 = Voltage in accordance with the arc voltage characteristic.

U_0 = Open-circuit voltage.

8 U_1 and I_1 indicates supply voltage and primary current at the indicated duty factors.

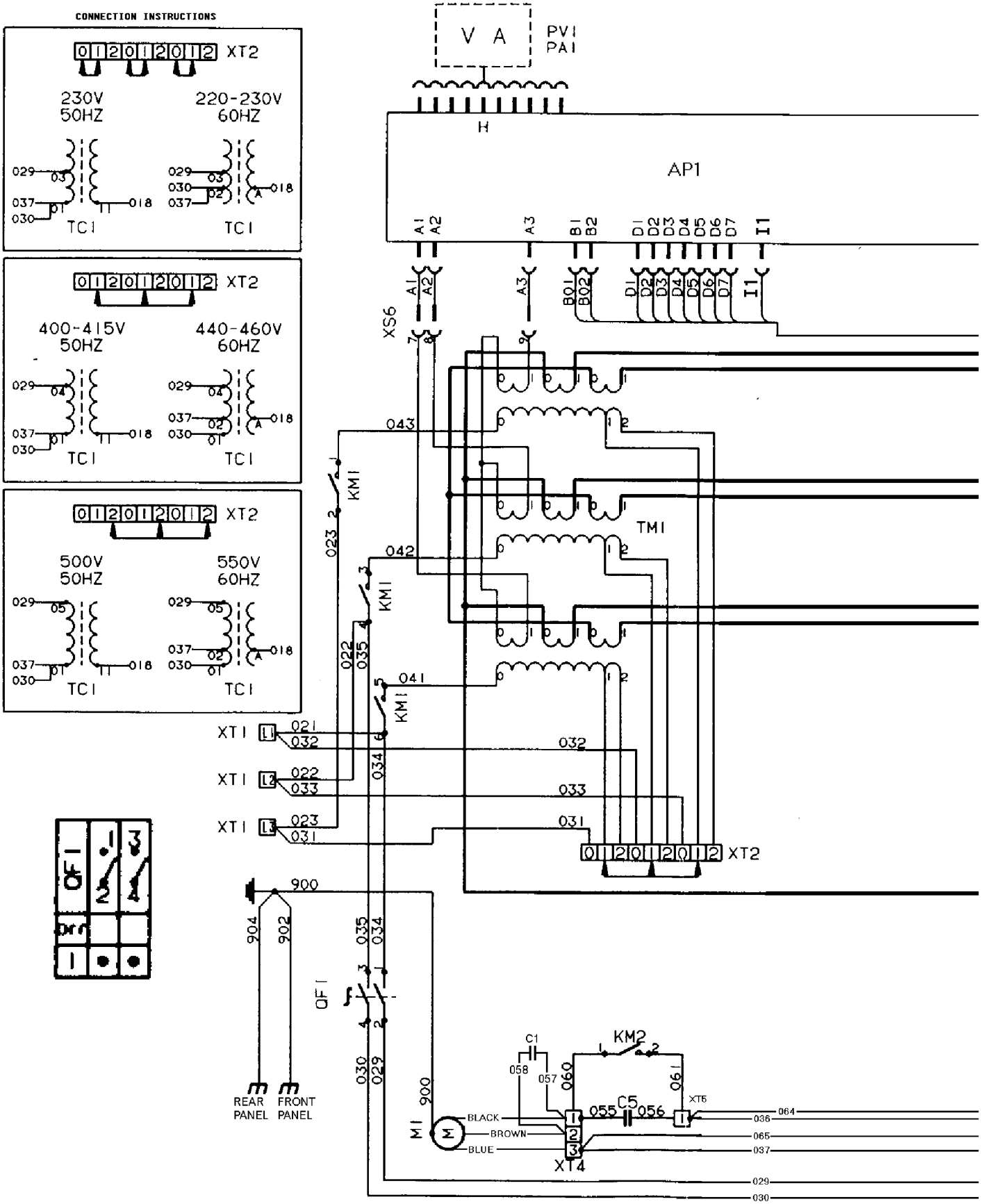
AF indicates that the unit is fan-cooled.

IP23 indicates the enclosure class with respect to protection against entry of foreign bodies and/or water.

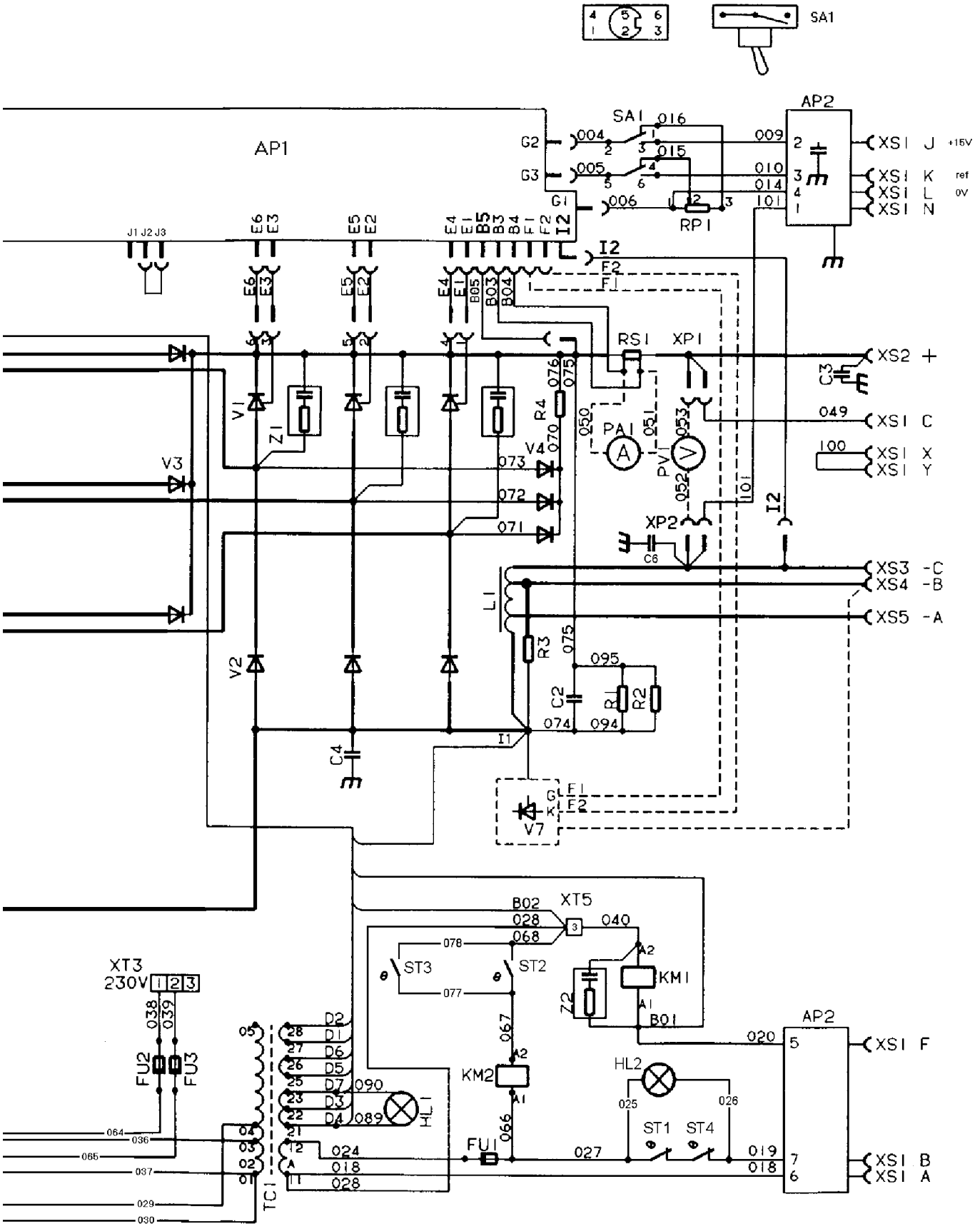
S This symbol indicates that the unit is designed for use in areas of elevated electrical hazard.

WIRING DIAGRAM LAR 500/630

Terminal XT2 and transformer TC1 are connected for 400-415 V 50 Hz, see connection instruction.



Connector J is only mounted at circuit board 481 593-884, see description on page 15 item 4.



GENERAL DESCRIPTION, LAR 500/630

The LAR 500/630 are thyristor-controlled power units for MIG/MAG welding. The main circuit consists of three thyristors and three diodes, connected to form a full-wave bridge. Voltage ripple (particularly at low welding voltages) is reduced by applying a base voltage of 15 V via diodes V3, supplied from a separate winding for this purpose on the main transformer.
Similarly, a base current is arranged by rectifying the output from the main transformer secondary winding via diodes V4 and connecting it to the positive welding terminal through a 1,1 Ω resistor. Note that the no-load voltage of the machine is about 50 V as a result of the voltage contribution from the base current winding. In order to be able to measure the true no-load voltage, it is necessary to disconnect conductor 070 from the base current winding. With the base current winding disconnected, the no-load voltage is about 17 V when RP1 is at its minimum position, and about 48 V with RP1 at its maximum position.
Conductor 070 must be disconnected and reconnected **only** when the machine is disconnected from its mains power supply.

COMPONENT DESCRIPTION, WIRING DIAGRAM

The following descriptions refer to the components shown in wiring diagram LAR 500/630 on page 6 and wiring diagram LAR 500/630 MAGMA on page 12.
Components only mounted in the Magma-machines are marked with an m to the left of the description.

	AP1	Circuit board, power unit: “DESCRIPTION OF OPERATING, CIRCUIT BOARD AP1” on page 14.
	AP2	Interference suppressor circuit board: see circuit diagram on page 38.
m	**AP3**	Circuit board, controlling the main thyristors during MMA welding and air-arc gouging. “DESCRIPTION OF OPERATING, CIRCUIT BOARD AP3” on page 31.
	C1	Start-and-run capacitor for cooling fan EV1, 3μF 400 V.
	C2	Capacitor, 1μF 400 V.
	C3, C4	Capacitor, 0,1μF 400 V.
	C5	Capacitor, 4μF 250 V, for reducing the speed of fan motor M1.
	FU1	Miniature circuit-breaker, 10 A, anti-surge. Protects the 42 V supply from transformer TC1.
	FU2, FU3	Miniature circuit-breakers, 5 A. Protect the 230 V supply from the primary side of TC1 to terminal XT3 (external cooling water pump).
	HL1	Indicating lamp, 42-48V, white. Indicates that the main power supply switch is On.
	HL2	Indicating lamp, 42-48V, yellow. Indicates excess temperature in the power unit. See also ST1 and ST4.
	KM1	Main contactor, 42 V, 50 Hz. Controlled by the welding torch contact. In LAR Magma KM1 is also energized when the MMA or arc-air gouging mode is activated.
	KM2	Contactor, 42 V, 50 Hz. Controlled by thermostat ST2 and ST3. Short-circuits capacitor C5, allowing fan motor M1 to run at full speed.

L1 Inductor, connected in series with the welding current circuit. The purpose of the inductor is to limit the short-circuit current and reduce welding harshness.
From serial no. 305-xxx-xxxx the inductor has a new design.
30% (50%) of the inductor winding is connected to welding terminal A, 73% (75%) to terminal B and 100% to terminal C. The values in brackets are referring to older machines. For older machines the new inductor can be used as a spare part, see the spare parts list.

M1 Cooling fan motor, connected for two speed operation: see ST2.

PA1 Ampere meter (analog) option.

PV1 Voltmeter (analog) option.

QF1 Main On/Off switch. In the On position (1), the unit is energised, the cooling fan starts and indicating lamp HL1 lights.

m **QF1** The LAR Magma allows change over between semi-automatic, manual welding and arc-air gouging by turning switch QF1.

R1 Resistor, 100 Ω 50 W. Together with resistor R2, it provides a dummy load for the thyristors to enable them to fire properly when operating on no-load.

R2 Resistor, 100 Ω 50 W.

R3 Resistor, 0,7 Ω

R4 Base current resistor, 1,1 Ω ±5%.

RP1 Potentiometer, 2,5 kΩ 2 W, for welding voltage control. Fitted with a multi-turn planetary reduction gear in the operating knob.

m **RP2** Potentiometer, 2,5 kΩ 2 W, for welding current control at MMA and arc-air gouging.

RS1 Shunt 600A / 60mV.

m **RS1** Shunt 600A / 120mV with a centre connection for 60 mV at 600 A.

SA1 Selector switch, Remote/Local control of the welding voltage.

m **SA2** Selector switch, Remote/Local control of the welding current at MMA welding and air-arc gouging.

ST1 Thermal cutout. The unit is fitted with a thermal overload protection cutout which protects the machine against excessive temperature rise caused by overload or inadequate cooling. The cutout interrupts the control power circuit, lights indicating lamp and HL2 and opens the main contactor.
The cutout is mounted close to the thyristors, and resets automatically when the power unit has cooled. Operating temperature is 93°C and the resetting temperature is 73°C. See also ST4.

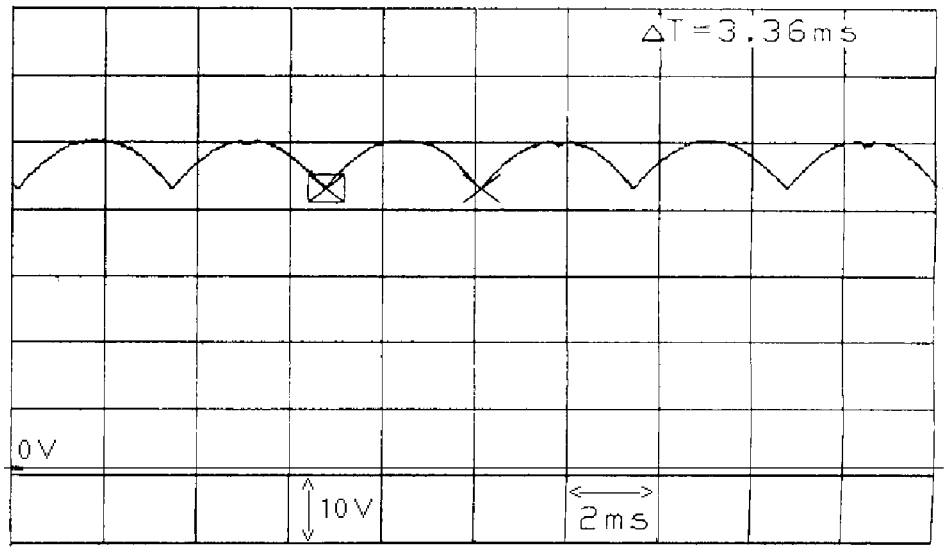
ST2 Thermostat, fitted to the rectifier cooling fins, and controlling the speed of fan motor M1 by means of connection or short-circuiting of capacitor C5, which is connected in series with the motor supply. The thermostat operates at a temperature of 60°C, closing contactor KM2 to short-circuit the capacitor and allowing the fan to run at full speed. The thermostat opens again when the temperature has fallen to 45°C. See also ST3.

ST3 Thermal switch, mounted in the main transformer. It works in paralell with thermal switch ST2. The switch is mounted from serial no. 338-xxx-xxxx.

	ST4	Thermal cutout, mounted on the inductor, L1. It works in series with thermal cutout ST1. The cutout is mounted from serial no. 535-xxx-xxxx.
	TC1	Control power transformer. An autotransformer winding on the primary side supplies 230 V to the fan motor. The secondary voltages are: 42 V between 11 and 12; 2 x 19 V between 21-22-23; 9 V between 25 and 26; 15 V between 27 and 28.
m	**TC2**	Control power transformer for circuit board AP3. Supplied at 38 V AC from connection 21 and 23 on TC1. The secondary voltage is 18 V AC.
	TM1	Main transformer, having three secondary windings: • The main winding supplies current to the thyristor rectifiers. • The base voltage winding supplies current to diodes V3. The purpose of the base voltage is to even out the voltage peaks at low welding currents. • The synchronising winding, supplying a synchronising signal for controlling the thyristors' firing points to circuit board AP1 (and AP3 in LAR Magma). The winding voltage, as measured between terminals A1-A2, A1-A3 and A2-A3 on circuit board AP1, is 18,5 V ±0,4 V at nominal mains voltage.
	V1	Thyristors: three.
	V2	Diodes: three in LAR 500 and six in LAR 630.
	V3	Base voltage diodes, 18.
	V4	Base current diodes: three @ 35 A.
m	**V5**	Freewheel diode.
	V7	Inductor short-circuiting switch, option. The thyristor short-circuits the inductor for about 100 ms when welding starts, ensuring a stable start.
	XP1, XP2	Flat pin outlet
	XS1	23 pole sleeve socket, connection to the wire feeder.
	XS2	Current terminal OKC 50.
	XS3-XS5	OKC 50 terminal set. For connection of the return current cable from the workpiece to the power unit. -A; Low inductance -B: medium inductance -C: high inductance
m	**XS7**	12 pole sleeve socket outlet connector for remote control of welding current in the MMA welding mode.
	XT1, XT3-XT5	Connection block, 3 pole.
	XT2	Connection block, 9 pole.
	Z1	Thyristor RFI suppressor, 1µF 22 Ω
	Z2	Contactor KM1 RFI suppressor, 0,5µF 220 Ω

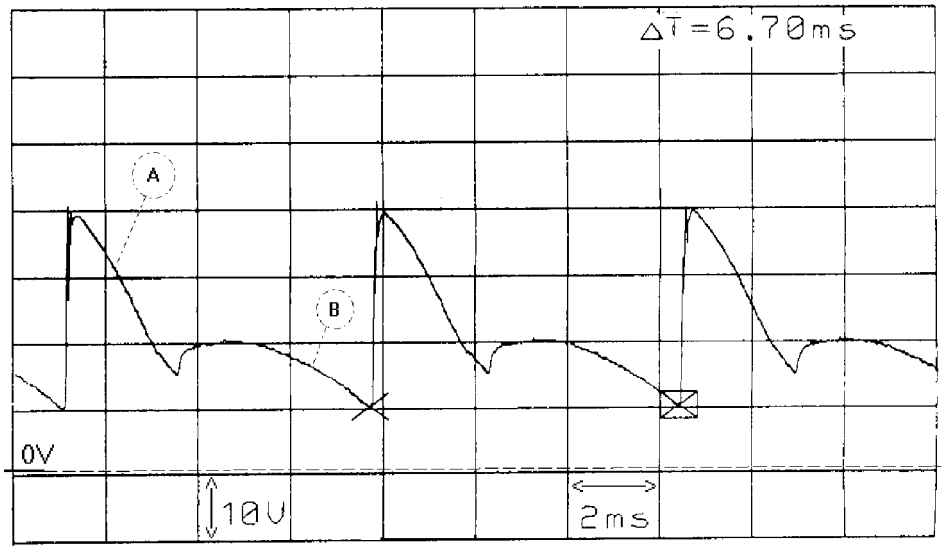
OUTPUT VOLTAGE FROM THYRISTOR BRIDGE

The diagrams below are oscilloscope plots of the voltage across R1.
The oscilloscope must be connected to the mains through an isolating transformer.



No-load voltage: mean value 47 V DC.

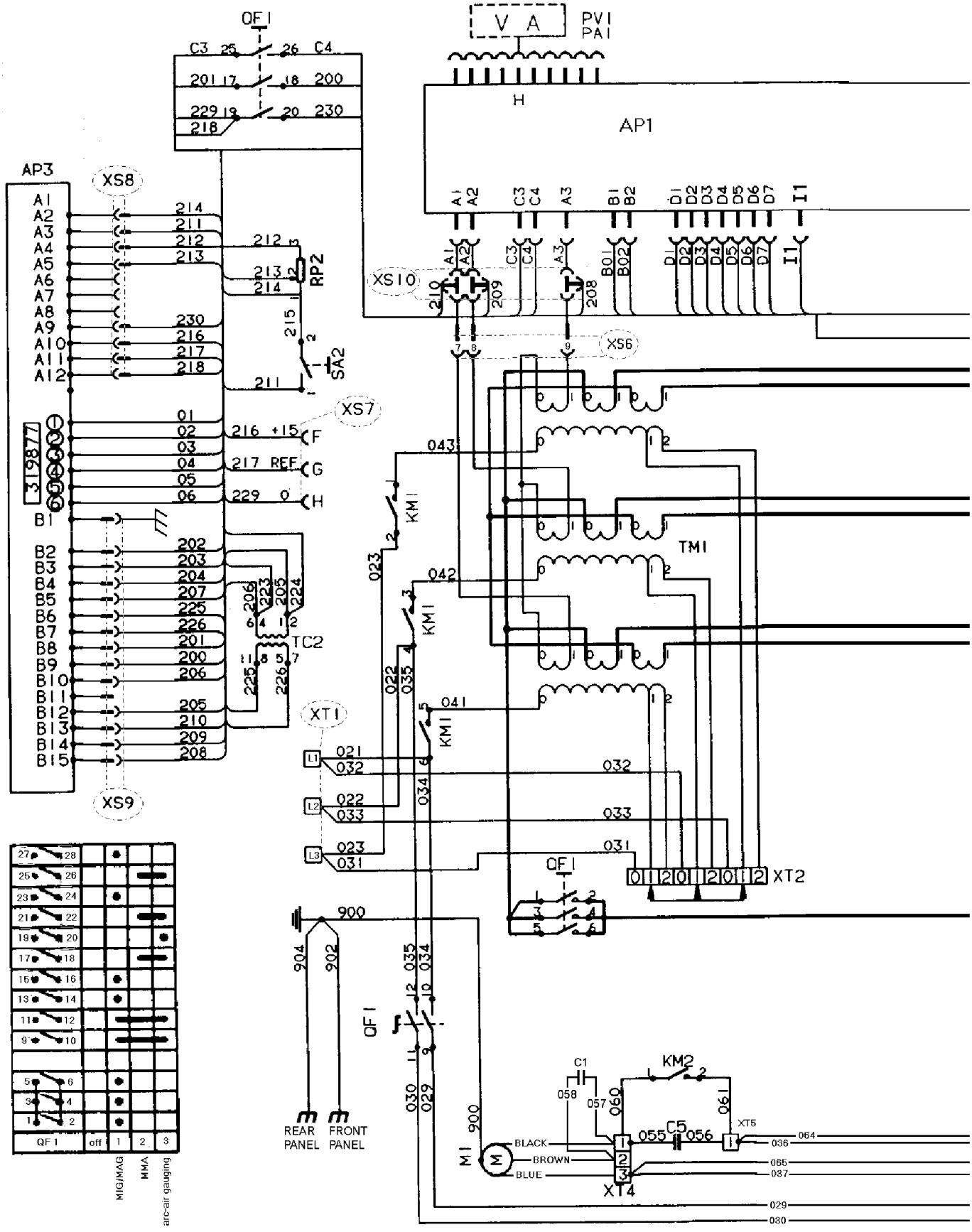
The no-load voltage is about 50 V as a result of the voltage contribution from the base current circuit (V4, R4).



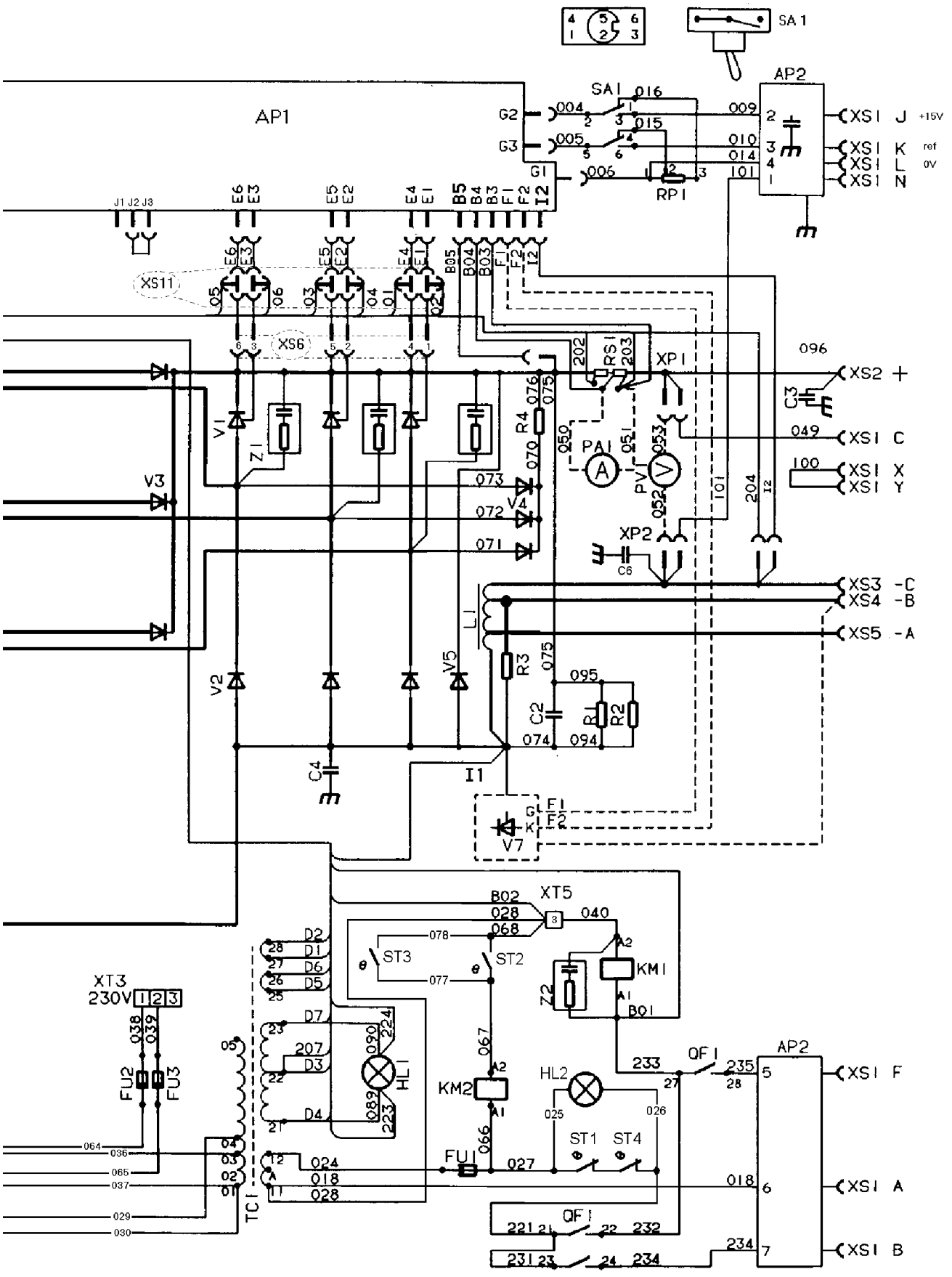
This diagram shows the machine connected to a resistive load and supplying a current of 100 A at a voltage of 19 V, with the voltage control knob set to a value of about 4.5. Curve **A** is the voltage contribution from the thyristor bridge, while curve **B** is the voltage contribution from the base voltage circuit (V3).

WIRING DIAGRAM LAR 500/630 MAGMA

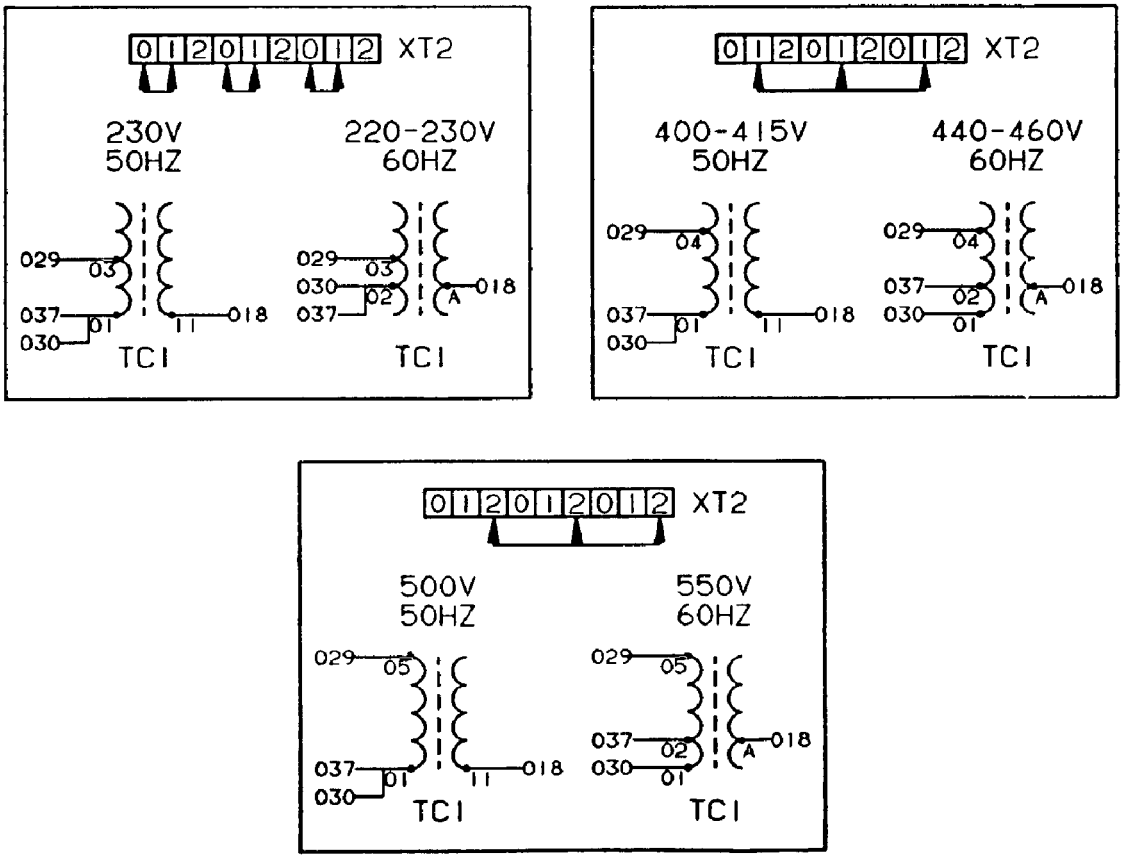
Terminal XT2 and transformer TC1 are connected for 400-415 V 50 Hz, see instruction on page 14.



Connector J is only mounted at circuit board 481 593-884, see description on page 15 item 4.



CONNECTION INSTRUCTION



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DESCRIPTION OF OPERATION, CIRCUIT BOARD AP1

This description refers to the circuit diagram on page 18 and to the component position diagram on page 20.

There are three versions of the circuit board 481 593 -880, -883 and -884. The difference between the versions is described under item 4 on page 15.

1. **Mains synchronising**

   The synchronising winding on transformer TM1 provides inputs A1, A2 and A3 with a phase voltage signal of 18,5 V ±0,4 V at nominal mains voltage.
   Three zero-crossing detectors provide the necessary reference signals for controlling the thyristor firing angles. The incoming phase signal at terminal A3 is filtered by RC network R1, R2 and C10, which produces a phase shift of 30°. The signal is then fed to the non-inverting input (+) of comparator IC1. The comparator provides a square wave signal of 0 - 5 V to the control circuit (10).

2. **Analogue inputs**

   The analogue inputs are used to measure voltage signals from the shunt (representing the welding current), thyristor bridge output voltage and arc voltage.

   At a welding current of 600 A, the shunt produces an output voltage of 60 mV, which is amplified by operational amplifier IC2. This amplified voltage signal is used for current control. It is also used to provide a signal to the power unit's digital ammeter and the overcurrent protection circuitry. Overcurrent protection is set at 750 A.

The circuits for measuring the thyristor bridge output voltage and the arc voltage are identical, apart from the output filters.
As the neutral of the electronic circuitry is connected to the positive side of the welding current circuit, incoming voltages are negative which means that the signals are connected to the inverting inputs of the amplifiers. The amplifiers provide negative gain in an inverting mode, i.e. the output signal is attenuated with respect to the input signal: -64 V in results in an output signal of +5 V, i.e. attenuation and inversion.
The thyristor bridge output voltage provides a signal for voltage control of the unit.
The arc voltage signal is used for various purposes, including supplying a signal to the unit's digital voltmeter.

3. **Start and stop**

The start/stop sensing unit is galvanically isolated from the 42 V AC incoming signal from the wire feed unit. IC4 is an optocoupler with an AC input. The optocoupler has an active low output, i.e. in the absence of an input signal the output is held at +5 V by a pull-up resistor, and goes low in the presence of a signal.

Resistor R29 limits the LED current to about 10 mA, while zener diodes D8 and D9 mean that a minimum voltage of about 6 V is required for the optocoupler to operate.

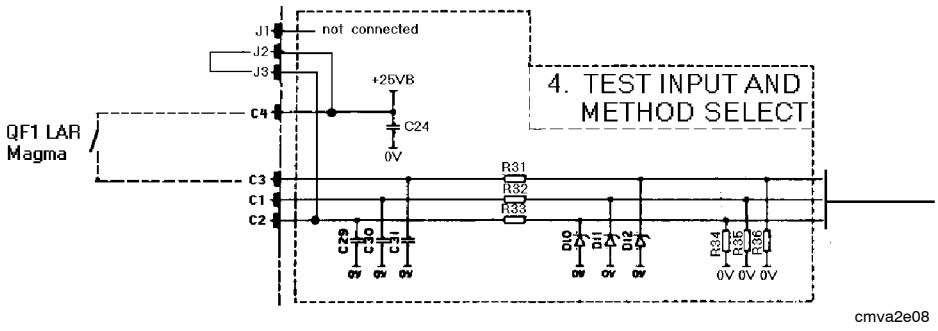
4. **Test input and method select**

The method select function is only used in LAR Magma. Inputs C2, C3 and C4 are normally low. When MMA welding or air-arc gouging is selected C3 is connected to +25 V by a contact in QF1.
The inputs are also used for test purposes (see the section entitled "TEST PROGRAM FOR CIRCUIT BOARD AP1" on page 24).

There are three different versions of the AP1 circuit board, -880, -883 and -884.
Version -880 has the program version P1.01. At circuit board -883 and -884 program version P1.02 is mounted, those boards are replacing -880.
The difference is that program P1.02 senses if there is a jumper between input C2 and C4 or not. Program version P1.02 is mounted from serial no. 305-xxx-xxxx.

Version -884 has a connection denominated J.
J2 and J3 are connected in paralell with C2 and C4. Version -884 fits in all LAR machines, version -883 can not be mounted in the Magma machines.

When the jumper between J3 (C2) and J2 (C4) is mounted, the arc voltage control is disabled (the ignition angle of the thyristors is locked). This improves the welding performance when using basic flux cored wire. All new circuit boards are delivered with the jumper mounted.



Test input and method select LAR Magma, circuit board AP1 version -884

5. **Galvanically insulated voltage reference**

This circuit provides a galvanically insulated voltage reference to the computer. It is supplied from a separate winding on control transformer TC1. Voltage regulator VR1 provides a regulated +15 V supply, while transistor Q8 and resistor R99 form a current limit circuit, set at 100 mA. Fuse S1 is rated at 315 mA.

The regulated 15 V signal is applied to the welding voltage control potentiometer via terminals G1 and G2. The 0-15 V voltage signal returned from the potentiometer via terminal G3 is converted by IC5 to a frequency signal that varies with voltage.
This digital signal is connected via optocoupler IC6 to the base of transistor Q3.
The signal from the collector of Q3 is in the form of a 0 to -15 V square wave, and is connected to the inverting input of IC3 for filtering, inversion and level changing to provide a 0-5 V signal to the computer.
Amplifier offset is adjusted by means of R51, while resistor R55 controls the gain.
With an input voltage of 0 V on G3, pulse frequency is about 8 kHz and the mark/space ratio is about 17%.
With an input voltage of 15 V on G3, pulse frequency is about 12 kHz and the mark/space ratio is about 25%.

0 V reference voltage at input G3 produces a welding voltage of 15 V.
15 V reference voltage at input G3 produces maximum welding voltage.

6. **Power supply**

The power supply board supplies +25 V, ±15 V, +12 V and +5 V.
+25 V and ±15 V are supplied from a 19-0-19 V winding on control transformer TC1, the output from which is rectified and smoothed. The +25 V supply, which is unregulated, powers the thyristor trigger circuits, supplying transistors Q4-Q6 via fuse S4. (This supply is shown in the diagram as 25 VA.) The fuse protects the board in the event of an anode/gate short circuit in any of the thyristors. Another branch of the 25 V circuit (25 VB) supplies IC11.
The ±15 V supply is regulated with fixed voltage regulators and supplies the analogue amplifiers.

The 9 V AC supply at inputs D5 and D6 is rectified and smoothed. The unregulated 12 V supply is used by the computer to sense loss of power supply, and also provides a power supply to the digital instrument unit.
V4 is an adjustable voltage regulator, which supplies +5 V for various items, including the logic circuits.
Fuses S2, S3, S4 and S5 are 1 A anti-surge 5 x 20 mm glass tube fuses.

7. **The display output**

This circuit is a buffer between the computer and the instrument unit. Data to be displayed is output together with the appropriate control signals to connector H. The data is decoded by the display driver in the display unit.
The zener diodes and series resistors protect the board against interference.
See circuit diagram on page 41 for details of the display unit circuitry.

8. **Inductor short-circuiter control**

The inductor short-circuiter ensures good starting of welding by briefly short-circuiting the inductor via an external thyristor when welding starts.

As long as the welding torch contact is not depressed, the base of transistor Q7 is held low by the control program, allowing current to flow through the LED in optocoupler IC12. The optocoupler has a thyristor output, which is open, allowing a gate current to flow to the external thyristor via contact F1.

The base of Q7 remains low until welding current has exceeded 20 A for 100 ms. When this condition is fulfilled, the base goes high, turning off the optocoupler and thyristor V7 (the short-circuiting switch) when the voltage across the inductor drops.

R82 and C51 form a filter circuit that protects against unintentional triggering of the optocoupler thyristor. C26 is a decoupling capacitor.

9. **Thyristor trigger circuits**

The thyristor trigger circuits consist of operational amplifier IC11, the non-inverting input of which is connected to a 1.4 V supply obtained from the +5 V supply and potential divider circuit R76 and R77. The inverting inputs of the amplifiers are connected to the computer. Power supplies to the amplifiers are +25 V and -5 V, with the latter being obtained by a zener diode in series with the -15 V supply.

When the inputs to the amplifiers are low, the outputs are high. Transistor Q4 (Q5, Q6) conducts and provides a trigger pulse to the thyristor(s).
The voltage level of the trigger pulses is about 0.6 V if the thyristors are connected to the circuit board. If the thyristors are disconnected from the board the voltage level of the pulses is about 22 V.
Current is limited by resistor R68 (R71, R74). Resistor R69 (R72, R75) prevents leakage currents or interference from triggering the thyristor(s).
Resistor R100 pulls down the non-inverting inputs of the amplifiers to -0.3 V in the event of loss of the +5 V supply, blocking the output of trigger pulses.

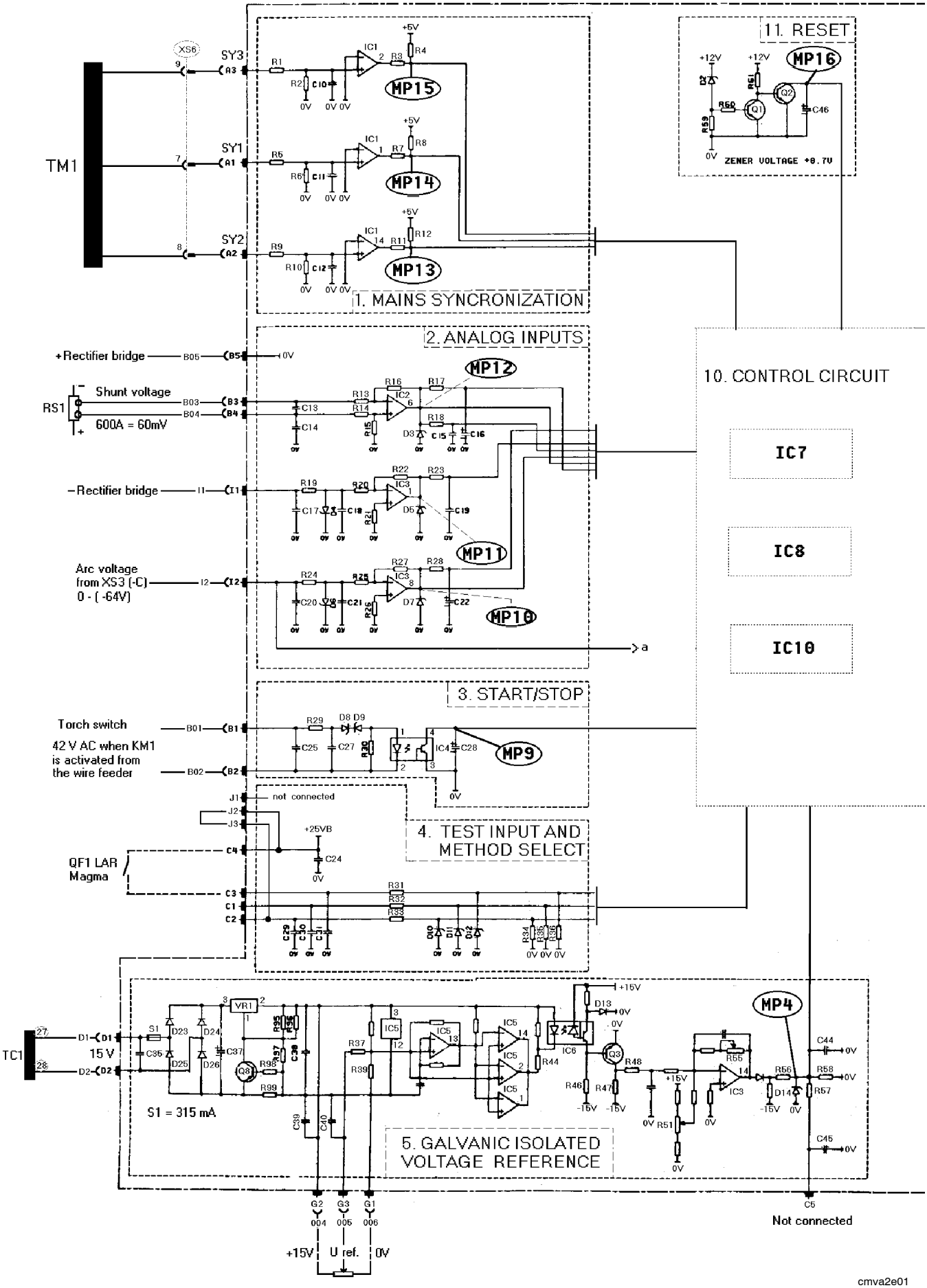
10. **Control circuits**

The control circuits deal with synchronising the signals to the mains, calculating the necessary firing angles, controlling the trigger circuits and maintaining constant welding voltage. In addition, they provide overload protection, output of data to the display unit and control of the inductor short-circuiter.

11. **Reset circuit**

The reset circuit prevents incorrect operation of the computer in the event of loss of power supply. It monitors the power supply to the computer and generates a reset signal if the voltage drops. When the power supply is restored, the control program starts again from the beginning.

CIRCUIT DIAGRAM, CIRCUIT BOARD AP1



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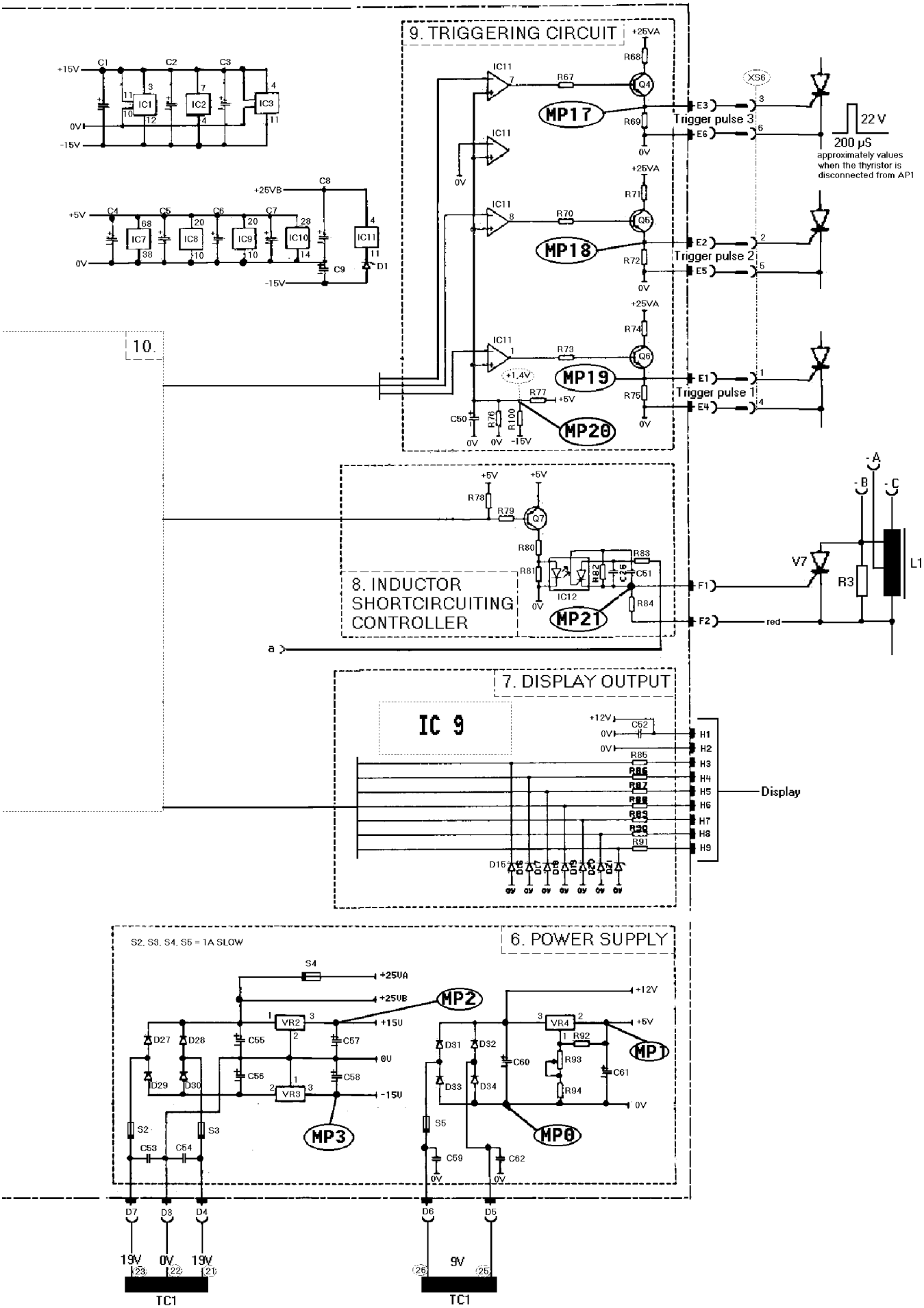
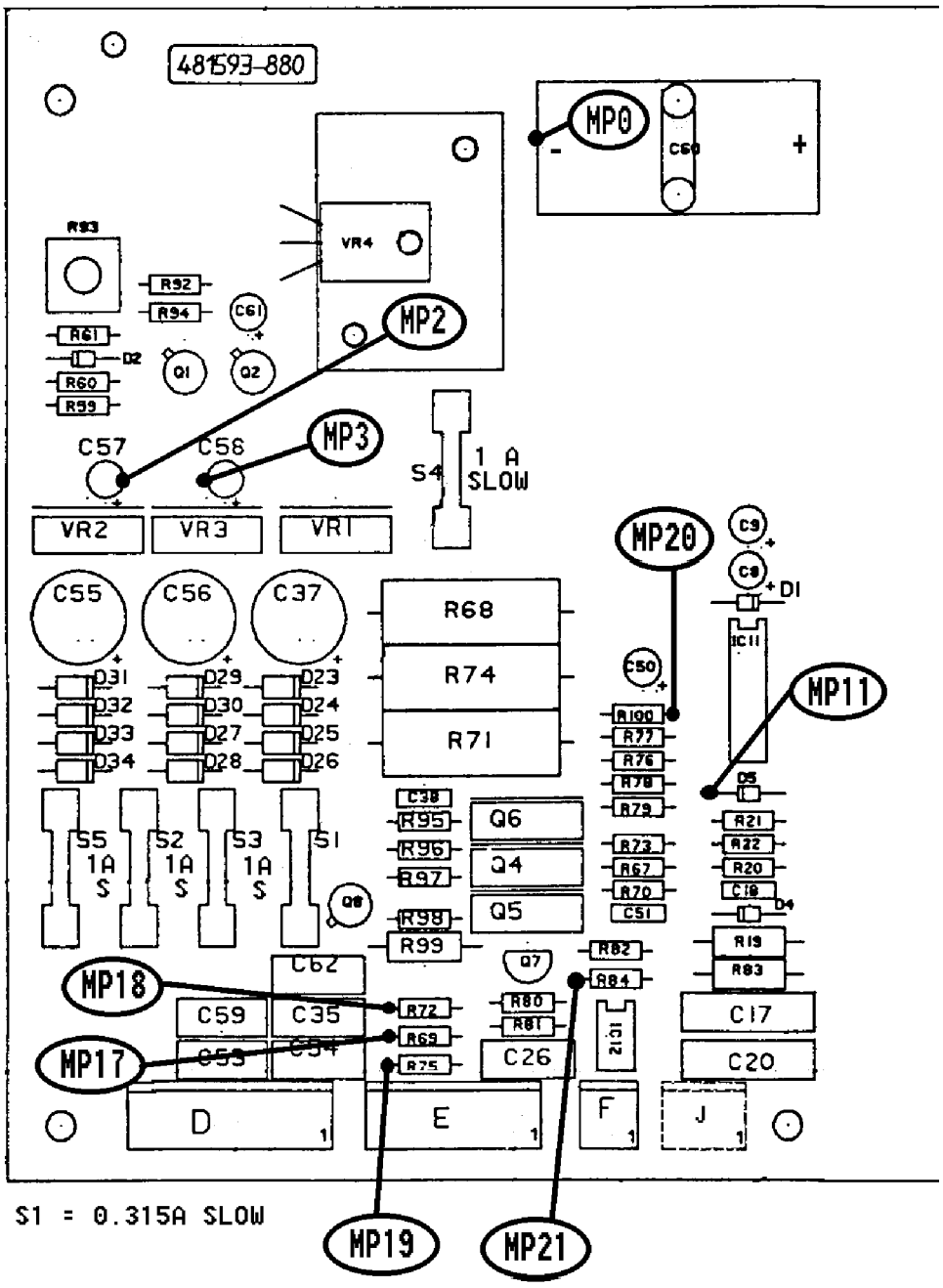

9. TRIGGERING CIRCUIT
+25VA
R68
IC11
R67
Q4
MP17
R69
0V
E3
E6
Trigger pulse 3
XS6
22 V
200 µS
approximately values
when the thyristor is
disconnected from AP1
+25VA
R71
IC11
R70
Q5
MP18
R72
0V
E2
E5
Trigger pulse 2
+25VA
R74
IC11
R73
Q6
+1,4V
MP19
R77
+5V
R75
0V
E1
E4
Trigger pulse 1
C50
R76
R100
-15V
MP20
+15V
C1
C2
C3
IC1
IC2
IC3
0V
-15V
+5V
C4
C5
C6
C7
IC7
IC8
IC9
IC10
IC11
+25VB
C8
C9
D1
10.
8. INDUCTOR
SHORTCIRCUITING
CONTROLLER
+5V
R78
R79
Q7
R80
R81
R82
C49
R83
C51
IC12
R84
MP21
F1
F2
red
V7
R3
L1
-A
-B
-C
a
7. DISPLAY OUTPUT
IC 9
+12V
C52
R85
R86
R87
R88
R89
R90
R91
H1
H2
H3
H4
H5
H6
H7
H8
H9
Display
D15
6. POWER SUPPLY
S2, S3, S4, S5 = 1A SLOW
S4
+25VA
+25VB
MP2
VR2
+15V
D27
D28
C55
C57
0V
D29
D30
C56
C58
VR3
-15V
MP3
S2
S3
C53
C54
+12V
VR4
+5V
R92
MP1
D31
D32
C60
R93
C61
D33
D34
R94
0V
S5
MP0
C59
C62
D7
D8
D4
D6
D5
19V
0V
19V
9V
TC1
TC1

COMPONENT POSITIONS, CIRCUIT BOARD AP1



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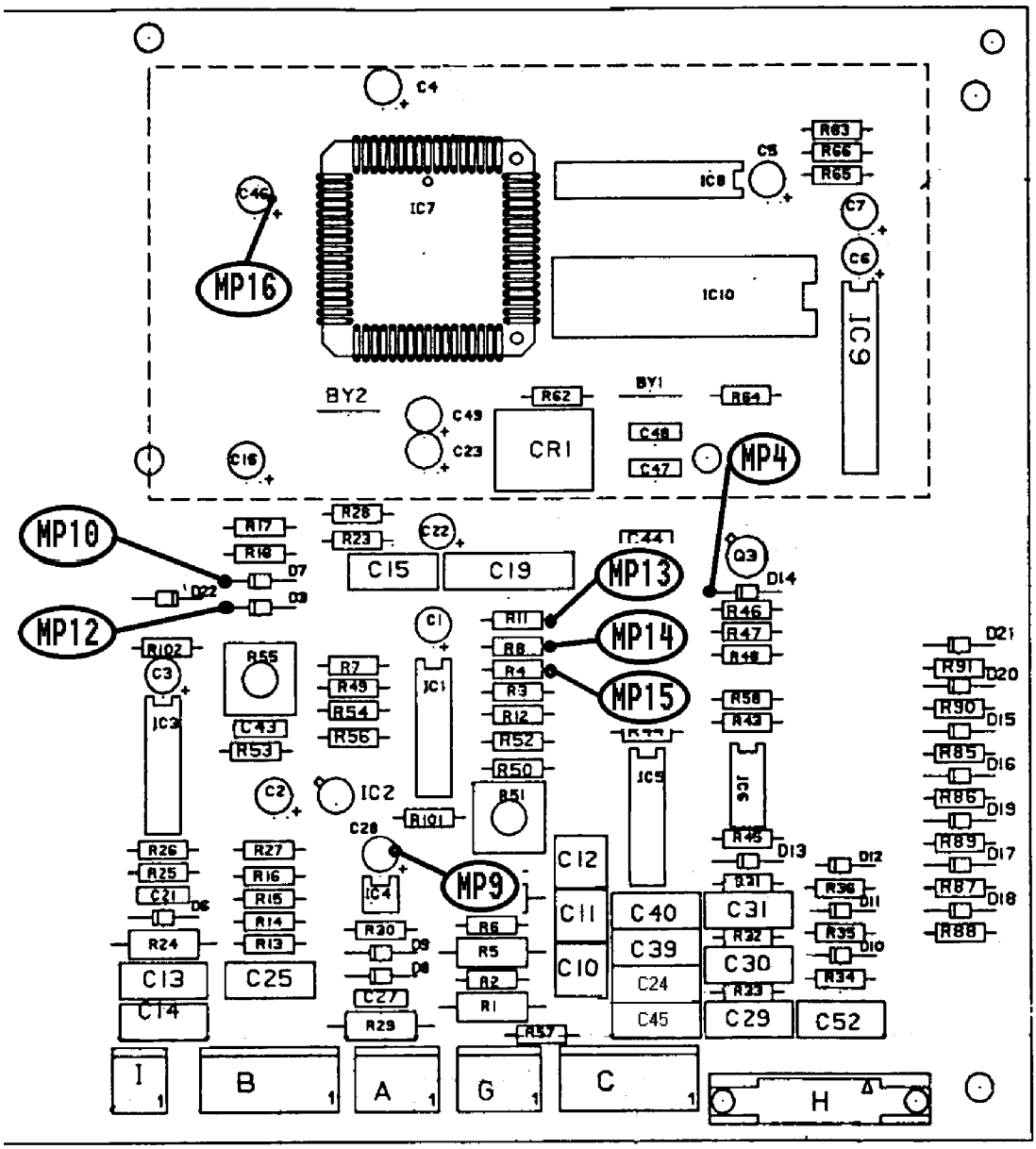
MP16
MP10
MP12
MP4
MP13
MP14
MP15
MP9
IC7
IC8
IC10
IC9
BY2
BY1
CR1
C15
C19
C13
C14
C25
C40
C39
C24
C45
C31
C30
C29
C52
C12
C11
C10
I
B
A
G
C
H

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TEST POINTS ON CIRCUIT BOARD AP1

Unless otherwise stated, the reference point for all voltages is the electronic neutral.
When measuring voltages on the board, we suggest that the instrument neutral be connected to the negative terminal of electrolytic capacitor C60, or to the positive welding terminal.

For identification of the test points listed below, refer to the component position diagram on page 20 and to the circuit diagram on page 18. The test points are marked with MP in the diagram.

Test point

0 Electronic neutral

1 +5 V power supply, tolerance ±0.02 V.

2 +15 V power supply, tolerance ±0.6 V.

3 -15 V power supply, tolerance ±0.6 V.

4 Welding voltage reference to the computer. At 0 V (min. ref.) at terminal G3, the value at MP4 should be 0.0 V ±0.02 V, while with a value of +15 V at terminal G3, the value at MP4 should be 5.0 V ±0.02 V.

9 Start and stop sensing. During the Stop state, the voltage is +5 V, while at Start, with 42 V AC across B1-B2, MP9 goes low (0 V).

10 Arc voltage signal, 0-5 V, linearly proportional to the input voltage at I2.
For an input voltage of -64 V on I2, MP10 must have a value of 5.0 V.

11 Thyristor output voltage, 0-5 V, linearly proportional to the input voltage at I1.
For an input voltage of -64 V on I1, the voltage at MP11 must be 5.0 V.

12 Shunt voltage signal, 0-5 V, linearly proportional to the input voltage between B3 and B4. With an input voltage of 0.1024 V between B3 and B4, the voltage at MP12 must be 5.0 V.

13-15 Synchronising signal, 0-5 V pulses. Incoming 50/60 Hz synchronising voltage on A1, A2 and A3 produces a 50/60 Hz square wave at MP13-15.

16 Enable signal for the computer, 0 or 5 V. Must be High for the computer to work.

17-19 Ignition pulse outputs. The following conditions must be fulfilled if ignition pulses are to be obtained when starting to weld:

- Alternating synchronising signals on A1, A2 and A3.
- Welding torch contact closed, i.e. MP9 is Low.
- A voltage between -5 V and -64 V present on I2. Ignition pulse length about 200 µs. Peak value of pulse voltage (without thyristor load) is about 22 V.

20 Reference level for ignition circuits is +1.4 V.

21 Control signal for the inductor short-circuiter. This signal is activated while welding is not in progress, and does not turn off until 100 ms after the start of welding, i.e. 100 ms after receipt of the following signals:

- Alternating synchronising signals on A1, A2 and A3.
- Welding torch contact closed, i.e. MP9 is low.
- A voltage of at least 2 mV, representing a welding current of at least 20 A, present on terminals B4-B3.

Operation of the inductor short-circuiter can most easily be checked by connecting an oscilloscope across resistor R3, which is connected in parallel with the inductor.

Note that the oscilloscope must be powered from a galvanically isolated power supply.

TEST PROGRAM FOR CIRCUIT BOARD AP1

The control board for the LAR 500/630 incorporates a built-in test routine, with its output data (except for that for test no. 13) being displayed by the display unit. The upper line of the display indicates the number of the test, while the lower line indicates the result or value of the test.

Enter the test mode by short-circuiting contacts C1 and C4 on the board when powering-up the board. Step through the tests progressively by opening and closing the link between C1 and C4. We recommend the use of a special test cable as shown in the diagram on page 26.

******* **IMPORTANT** *******

Testing can be performed with the board mounted in the unit, but not when welding is in progress. When performing test no. 14, contact E (for the ignition pulses) must be disconnected before testing. When in the 'Torch Contact Closed' test position, make sure that the pressure arm in the wire feed unit is slackened, in order to avoid unintentional feed of the wire.
In order to avoid problems, always disconnect board contact E and slacken the pressure arm in the wire feed unit before entering the test mode.

****

The test points to use in making measurements for each particular test are listed below for each test.

INPUT SIGNALS

Test no.

1 U-ref/MP4 When sweeping the reference voltage at terminals G1-G3, the display must respond with 0-255. Sweep the voltage by means of potentiometer RP1 on the power unit.

2-4 MP12, shunt signal. 0 - 0.102 V on B4-B3 must result in display of 0-255. Scaling is 4 A/unit.
Apply an external voltage to the shunt input in order to simulate a current signal. (0.1 V represents 1000 A.)

5 MP11, voltage from the thyristor bridge. A voltage signal of 0 to -64 V at I1 must result in a display of 0-255. Scaling is 0.25 V/unit.
When testing the board in the power unit, the base current voltage will be obtained when the welding torch trigger is pressed.

6-7 MP10, arc voltage. A voltage signal of 0 to -64 V on input I2 must result in a display of 0-255. Scaling is 0.25 V/unit.
When testing the board in the power unit, the base current voltage will be obtained when the welding torch trigger is pressed.

8 Synch1/MP14, synchronising signal. The display shows the number of incoming positive flanks at A1 during a period of one second, i.e. the frequency in Hz (±1Hz). When testing the board in the power unit, synchronising signals will be obtained when the welding torch trigger is pressed.

9 Synch2/MP13, synchronising signal. As above, except for A2.

10 Synch3/MP15, synchronising signal. As above, except for A3.

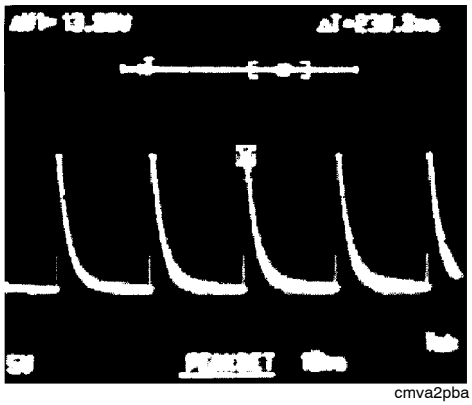
11 Start/MP9, start/stop signal. The display will show 111 if the start signal is detected, or nothing if it is not detected.

12 Method selection, only valid for LAR MAGMA.
The display shows 100 if input C3 is high, i.e. when switch QF1 connects C3 to C4. When testing the power source the test is carried out with the method switch.

OUTPUT SIGNALS

Measure these signals using an oscilloscope powered through an isolating transformer.

13 Inductor short-circuiter, MP21. 50 Hz pulses, with a pulse length of 0.5 ms, should be present at inductor short-circuiter output F1. Measure the signal between MP3 and MP21, with contact F unconnected. The voltage on I2 must be 0 V, which can most easily be arranged by disconnecting terminal I.
In order to ensure seal-in current through the thyristor of the optocoupler, the measurement probe must be of high-resistance type, 1-10 MΩ. The waveform trace is shown below. The decay time can vary, depending on the impedance of the measurement probe. No input signals are required for this test.



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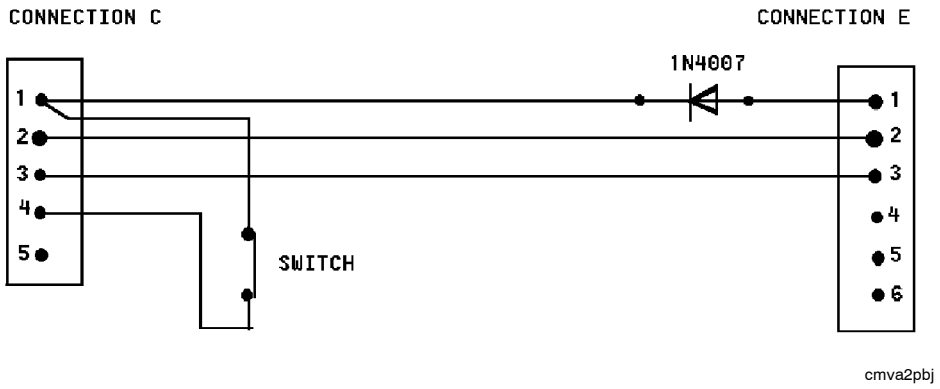
14 MP17-19, Trigger pulses, mutually displaced by 120 degrees, appear at outputs E1, E2 and E3. Their frequency is about 50 Hz, and the pulse lengths are about 200µs. **When measuring these signals, contact E must be disconnected from the board, i.e. the thyristors must not be connected to the board.**
Board contact E can be connected with C1, C2 and C3 by means of a special test cable, as shown below, which permits the use of the display to see whether trigger pulses are being generated.
A one in the display indicates that trigger pulses are present, while a 0 indicates their absence. The left-hand indication in the display shows E1 for the first phase, E2 for the next and so on. No input signals are required for this test.



DESCRIPTION OF OPERATION OF LAR MAGMA IN MMA MODE

GENERAL DESCRIPTION

The LAR MAGMA is intended for MIG/MAG welding, MMA welding and air-arc gouging. The control electronics on circuit board AP3 controls the welding current in the MMA and air-arc gouging modes. In those modes the current is set by potentiometer RP2.

The following description refers to the block diagram on page 30.

1 Reference potentiometer RP2 for adjusting the welding current.

2 Reference potentiometer, connected to remote control socket XS7, for remote adjustment of the welding current.

3,4,5 Galvanically isolated remote control device.
The remote control circuit employs a double-winding transformer (TC2), associated rectifier and voltage stabilisation circuit, A/D converter, optocoupler and D/A converter.
A pulsed voltage transfers the reference voltage from the remote control terminal socket via the optocoupler to the D/A converter, the output of which is an analog reference voltage.

6 Selector switch SA2 selects local or remote control of the reference voltage.
The actual switching of the voltage reference signals is effected by analog switches: the block diagram shows the switching only schematically.

7 Current reference boost in response to short circuits.

8 Reference voltage input from the local and external potentiometers respectively.

9 This circuit boosts the welding current in the event of an arc short circuit, thus preventing the electrode from burning on to the work during welding. The current reference signal is increased electronically via 7) and 20).

10 Assists striking of the arc by means of an elevated current reference signal during starting. See 14), 'Hot start'.

11 Reduces the welding current in the event of a long-duration short circuit, i.e. if the electrode has burnt on to the workpiece. See 13), 'Foldback'.

12 Input for current signal from elevated shunt voltage.

13 Foldback.
This is a timer circuit that starts when the arc is short-circuited. It reduces the welding current via 11) if the short circuit persists, i.e. if the electrode has burnt on to the workpiece. This helps to protect the thyristors against abnormally high and/or long-duration short circuits.
The foldback feature operates only in the MMA welding mode.

14 Elevated starting current (starting boost, hot start)
The starting current circuit briefly increases the welding current when starting to weld. The peak value of the starting pulse is about twice the set value of welding current, and gives the power source good starting characteristics during MMA welding.

15 Power supply unit for the electronic equipment, supplying stabilised DC at ±15 V. The neutral of the electronic circuitry is connected to the positive of the welding voltage (+ on XS2).
The power supply unit receives an alternating voltage from TC1.

16 Control comparator/amplifier, which compares the voltage signals from 8-12) and then amplifies the summing voltage to provide a suitable control voltage signal to the trigger unit 17). The good dynamic welding performance of the LAR MAGMA is partly due to the characteristics of the amplifier.
The no-load detector 21) reduces the amplifier output signal when there is no arc.

17 Trigger unit
The trigger unit consists of three identical circuits (one for each phase).
Each circuit provides trigger pulses for its thyristors, with phase angles in proportion to the output voltage from the control amplifier. Auxiliary windings on the main transformer provide synchronising signals.

18 The switch QF1 disconnects the trigger pulses from AP3 when LAR MAGMA is in MIG/MAG welding mode.

19 Shunt amplifier, amplifying the signal from the current shunt to a suitable level for input to 12).

20 Short-circuit detector, sensing short circuits of the arc. See also 13).

21 No-load detector, senses no-load (open-circuit) voltage. See also 14) and 16).

23 Control amplifier for air-arc gouging, producing a DC voltage that is proportional to the reference voltage signal from 6), to give a constant-voltage characteristic. The shunt signal from 19) is used to provide a current limit that protects various parts of the system, including the thyristor rectifier 26).

24 Changeover switch for air-arc gouging, in the form of a multi-position switch on the front panel, which also controls selection of MMA and MIG/MAG welding. (See 18).)

25 Main transformer (three-phase).

26 Thyristor rectifier.

27 Basic current resistor R4.

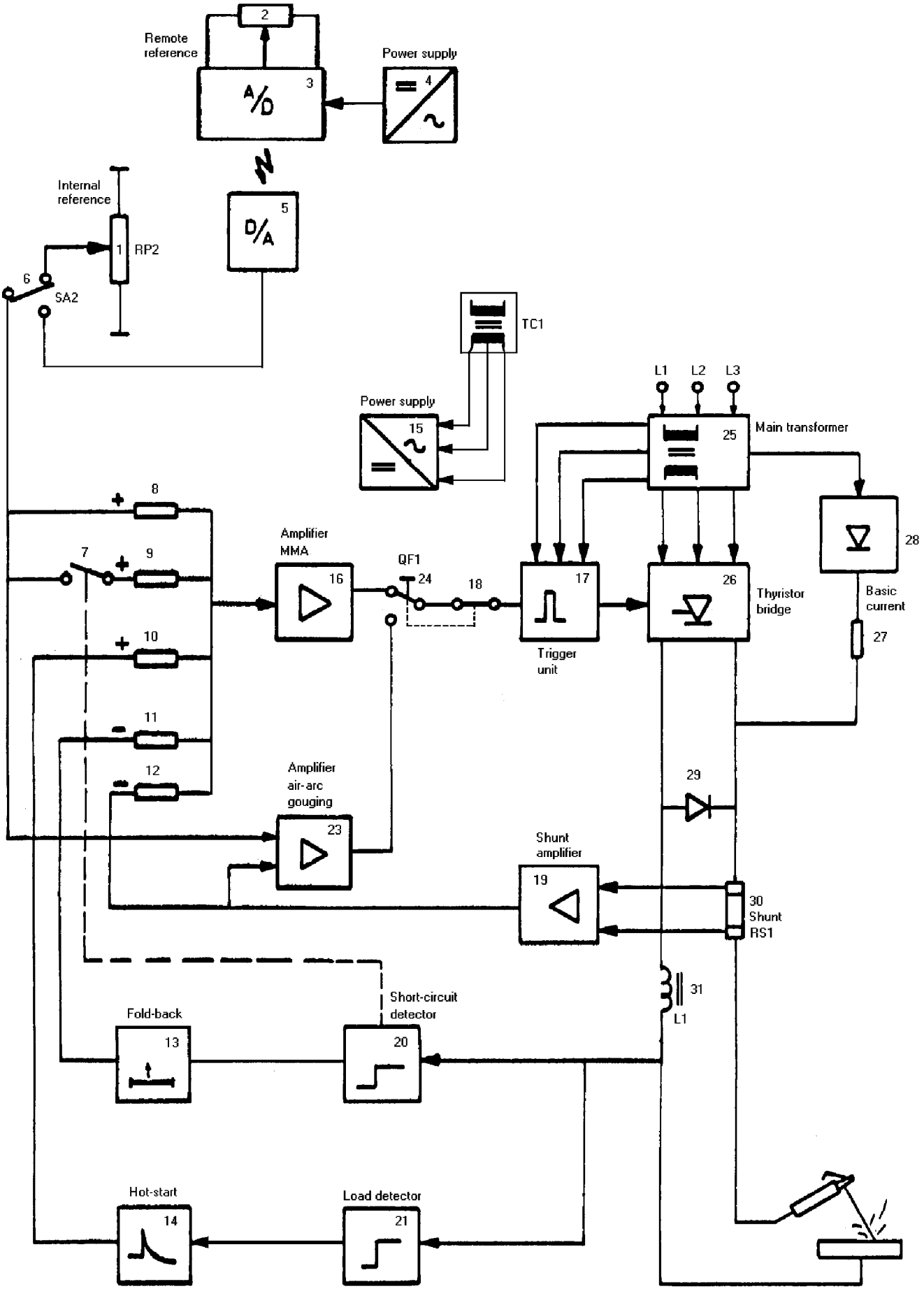
28 Basic current rectifier V4.

29 Freewheel diode V5.

30 Shunt for measurement of welding current.

31 Inductor for smoothing welding current.

BLOCK DIAGRAM, LAR MAGMA IN MMA MODE



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DESCRIPTION OF OPERATION, CIRCUIT BOARD AP3

This description refers to the circuit diagram on page 34. The same reference numbers that were used in the block diagram on page 30 are also used in the description of the circuit board.

1 Reference input.
Reference potentiometer RP2 (2.5 kΩ ±10% 2 W, linear) is supplied at +15 V and connected to A2, A4 and A5.
The reference voltage is limited to 0-10 V by potential divider R3/R4, and connected to analog switch IC1.

2 Remote control device.
The remote control device, which can be a potentiometer or a pulse generator, is connected to circuit board terminals A10, A11 and A12 via remote control input XS7.

It is supplied at 15 V via pins F and H in input XS7. The reference voltage from the remote control device is connected to pin G.
0 V between G and H results in minimum current, and 15 V gives maximum current.

3 A/D converter.
The A/D converter and the voltage reference unit (see 4), below) are galvanically isolated from the rest of the control circuitry by optocoupler IC12 (see 5), below).
The A/D converter converts the reference signal to a pulse train, in which the mark/space ratio represents the magnitude of the reference signal.

Optocoupler IC12 transfers the pulse train to the D/A converter, thus ensuring complete galvanic isolation between the voltage signal from the remote control input and the other electronic equipment.

If selector switch SA2 is in the REMOTE position, but no remote control device is connected, the power source will give low welding current, as R112, in the A/D converter, produces a low value of current reference signal.

4 Galvanically isolated voltage reference.
The secondary output voltage from transformer TC1 supplies 38 V to control power supply transformer TC2. The secondary voltage from TC2 supplies 19 V to remote control output voltage regulator VR1 via terminals B6 and B7 and diode bridge BR1.

The output voltage from VR1 is 16.2 V, which is reduced to 15.6 V after diode D12. The regulator is current-limited to 120 mA by resistors R104-107, transistor Q19 and diode D12, making the remote control connection short circuit-proof.

5 The D/A converter, which recreates the mean value of the reference signal from the pulse train from 3). The input signal is first amplified and filtered: trimming potentiometer R87 adjusts the output signal from IC4:1 to 0 V when the remote control potentiometer is at its minimum position and to +11.5 V when the potentiometer is at its maximum position. The signal is then passed to analog switch IC1, which is controlled by the LOCAL/REMOTE selector switch.

6 LOCAL/REMOTE selector switch.
Three analog switches (IC1) control signal switching for selection of local (internal) or remote (external) control of the welding current. These switches are, in turn, controlled by selector switch SA2. The control voltage, which can be measured at terminal A3, is either 0 V (SA2 closed = internal reference) or about +27 V (SA2 open = remote reference).

IC1 contains four identical analog switches, of which three are used for local/remote changeover switching. The switches conduct with a control voltage of +15 V on pins 6, 12 and 13, and are open-circuit with a control voltage of 0 V.

15 Control power supply.
The control power supply is obtained from a 19-0-19 V winding on transformer TC1. The circuit board terminals B10 and B12 are supplied with 19 V respectively and the centre of the winding is connected to B5, which is the neutral in the electronic circuitry. Capacitors C51, C52 and C53 decouple any HF interference.

Resistors R125-127 are film resistors that protect the transformer winding against any short circuits on the circuit board. Together with capacitors C54-C58, they also filter out transient peaks in the 19 V supply caused by the thyristors firing.

Voltage regulator VR2 produces a +15 V stabilised voltage: trimming potentiometer R129 provides fine adjustment. Resistors R128 and R130 restrict the range over which the voltage can be adjusted to a maximum voltage of +18 V, which is the maximum permissible supply voltage for the CMOS circuits.

D21 stabilises the negative voltage to -15 V. The power rating of R131 is such as to allow the circuit to supply a load current of 30 mA.

17 The trigger unit converts the DC signal from the control amplifier 16) to ignition pulses that fire the thyristors at the correct point in the cycle.

The unit consists of three identical sections, one for each thyristor. A synchronising winding on transformer TM1, connected to terminals B13-15, provides synchronising information for correct firing.
The voltage between B13/B14/B15 is approximately 35 V.

The ignition pulses are connected to each thyristor. The gate connections are twisted together with the associated neutral connections in order to minimise the risk of interference in the gate circuit.

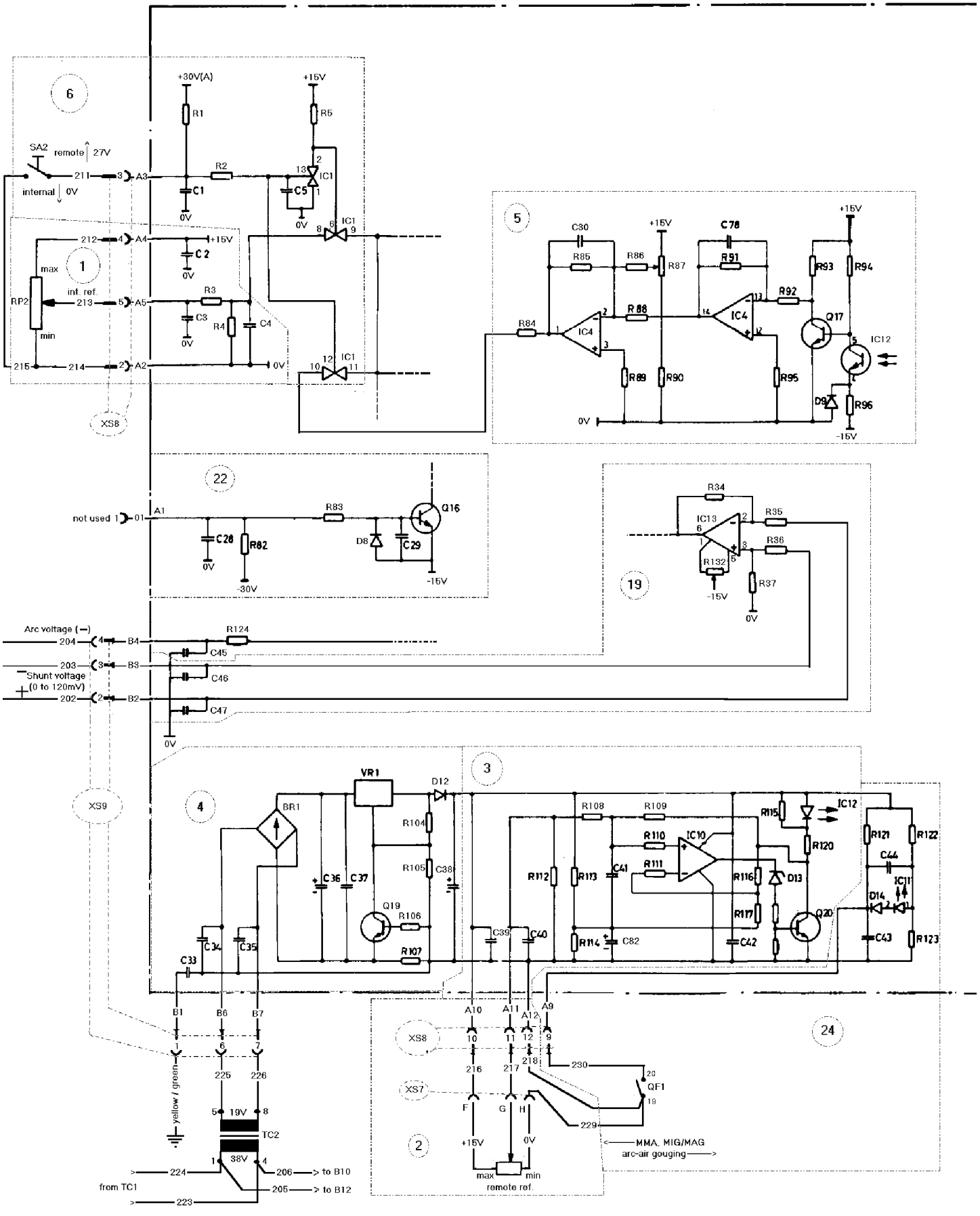
18 The switch QF1 interrupts the power supply to output transistors Q9, Q12 and Q15 in the trigger unit when LAR MAGMA is in the MIG/MAG welding mode.

19 The shunt amplifier amplifies the voltage signal from the shunt. Trimming potentiometer R132 adjusts the output voltage from the amplifier to -20 mV when no welding current is flowing.
The shunt provides an output voltage signal of 120 mV for 600 A welding current.

22 This part of AP3 is not used in LAR MAGMA.

24 Air-arc gouging/MMA changeover.
A contact on switch QF1 links contacts A9-A12 in the galvanically isolated remote control circuit to change the operating mode to air-arc gouging.
(Switch QF1 also selects MMA or MIG/MAG welding modes.)
Optocoupler IC11 is activated in the air-arc gouging mode, and in turn activates the air-arc gouging control circuits.

CIRCUIT DIAGRAM, CIRCUIT BOARD AP3



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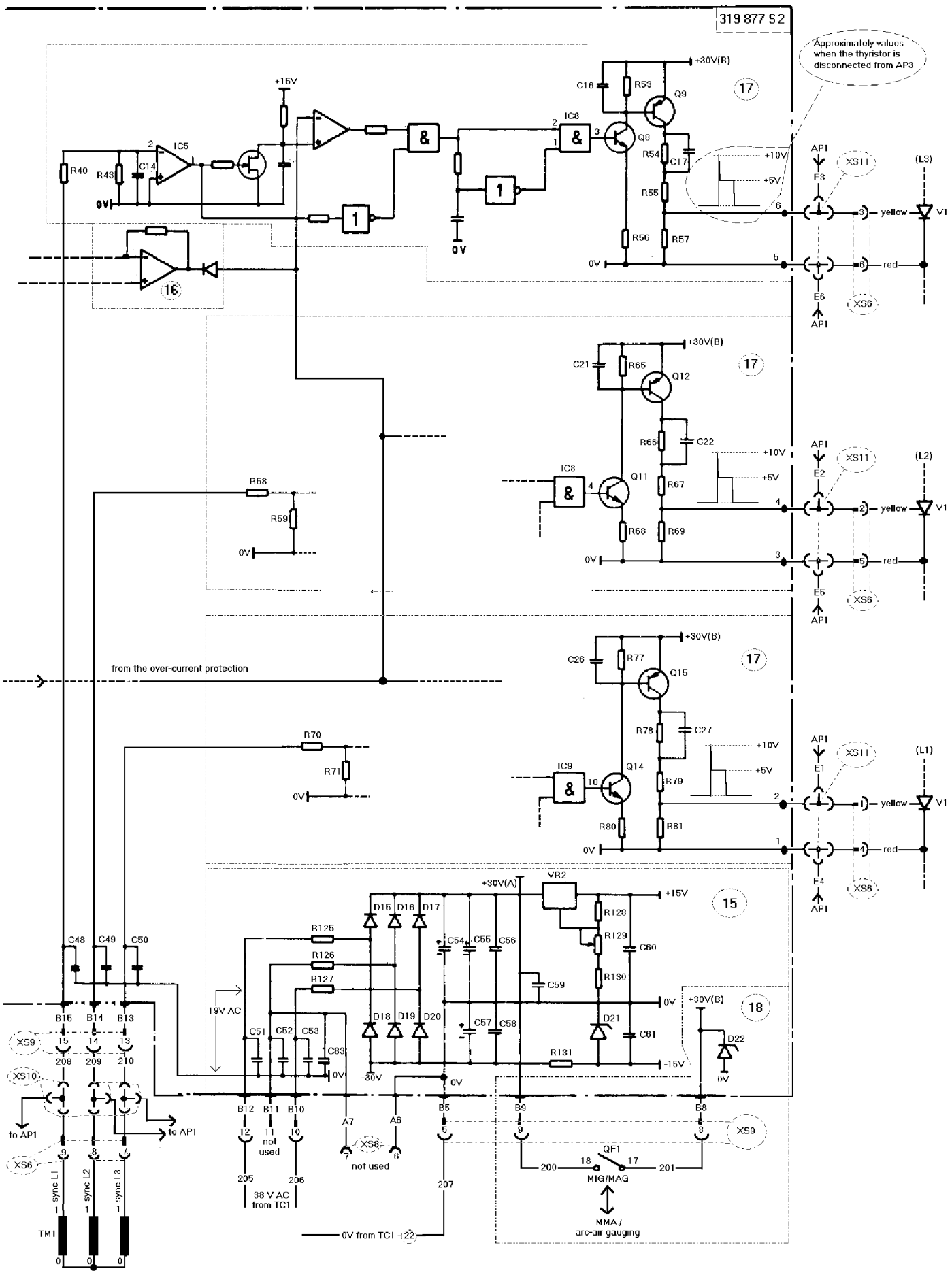
319 877 S2
Approximately values when the thyristor is disconnected from AP3
+15V
+30V(B)
+30V(A)
0V
-30V
-15V
IC5
IC8
IC9
R40
R43
C14
C16
R53
Q9
Q8
R54
C17
R55
R56
R57
+10V
+5V
AP1
XS11
XS6
(L3)
(L2)
(L1)
V1
yellow
red
C21
R65
Q12
R66
C22
Q11
R67
R68
R69
R58
R59
C26
R77
Q15
R78
C27
Q14
R79
R80
R81
R70
R71
from the over-current protection
VR2
R128
R129
C60
R130
C59
R125
R126
R127
C48
C49
C50
C51
C52
C53
C83
C54
C55
C56
C57
C58
D15
D16
D17
D18
D19
D20
D21
D22
C61
R131
19V AC
15
16
17
18
B15
B14
B13
B12
B11
B10
B9
B8
B5
A7
A6
XS9
XS10
XS8
XS6
208
209
210
205
206
207
200
201
to AP1
not used
38 V AC from TC1
0V from TC1 (22)
QF1
MIG/MAG
MMA / arc-air gauging
sync L1
sync L2
sync L3
TM1

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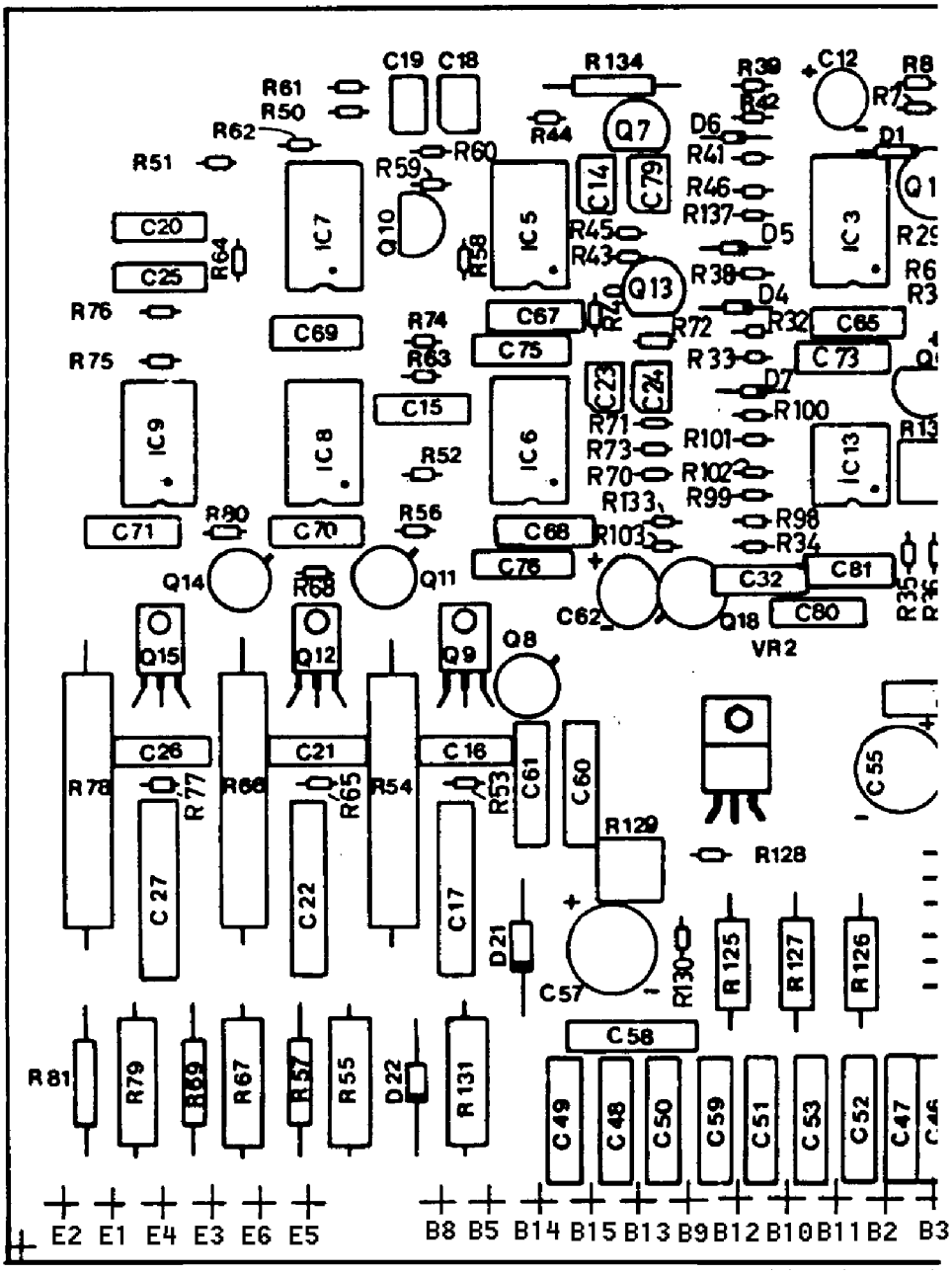
COMPONENT POSITIONS, CIRCUIT BOARD AP3



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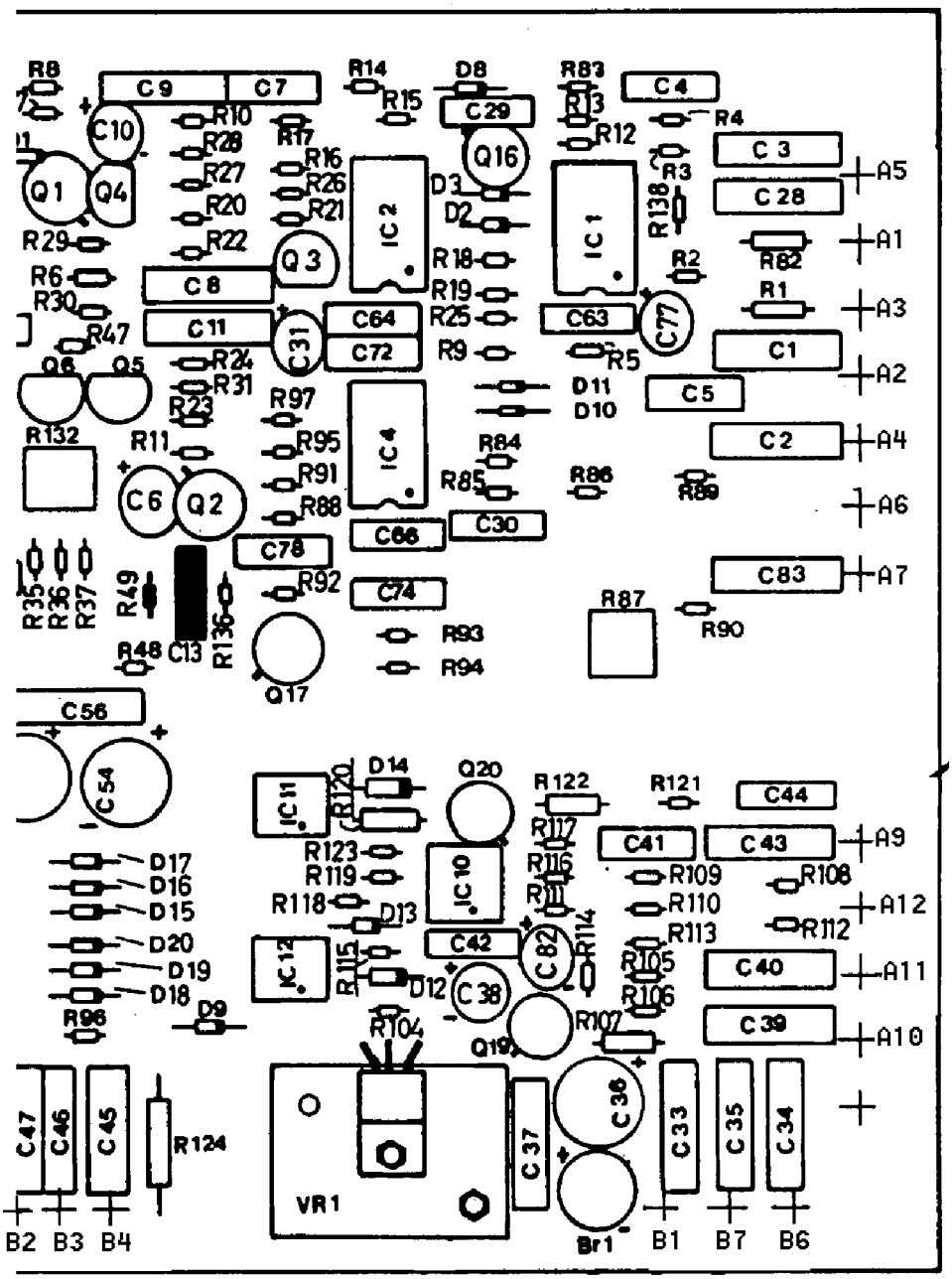
R8
C9
C7
R14
D8
R83
C4
C10
R15
C29
R13
R4
R10
R28
R17
R12
C3
Q1
Q4
R27
R16
Q16
R3
A5
D3
R26
R138
C28
R20
R21
IC2
IC1
D2
R29
R22
R18
R82
A1
Q3
R2
R6
C8
R19
R1
R30
C64
R25
C63
C77
A3
C11
C31
R47
C72
R9
C1
R24
R5
Q6
Q5
R31
D11
A2
C5
R23
R97
D10
R132
R95
R84
C2
A4
R11
IC4
R91
R85
R86
R89
C6
Q2
R88
A6
C66
C30
C78
C83
A7
R35
R36
R37
R49
R92
C74
R87
R136
R93
R90
R48
C13
R94
Q17
C56
C54
D14
Q20
R122
R121
C44
IC11
R120
R117
C41
C43
A9
D17
R123
R116
R109
R108
D16
R119
IC10
R111
R110
A12
D15
R118
D13
R114
R113
R112
D20
C42
C82
R115
R105
C40
A11
D19
IC12
D12
C38
R106
D18
R96
D9
R104
Q19
R107
C39
A10
C47
C46
C45
R124
C37
C36
C33
C35
C34
VR1
B2
B3
B4
Br1
B1
B7
B6

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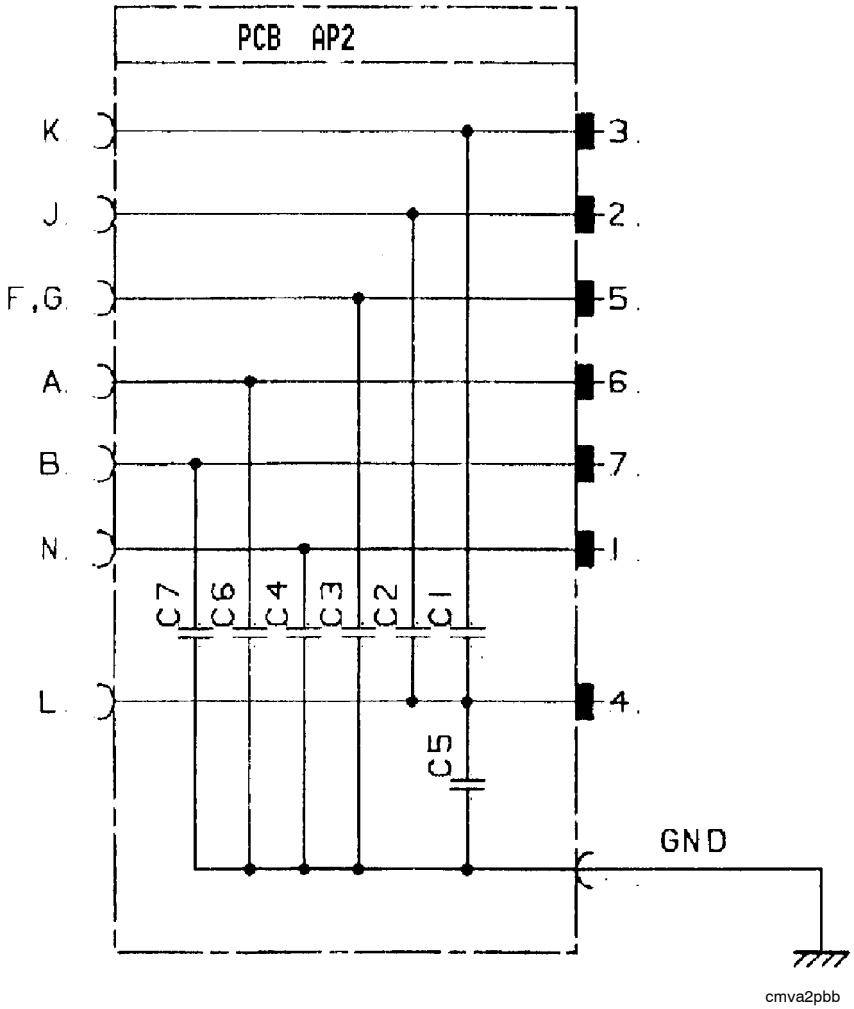
CIRCUIT DIAGRAM, CIRCUIT BOARD AP2



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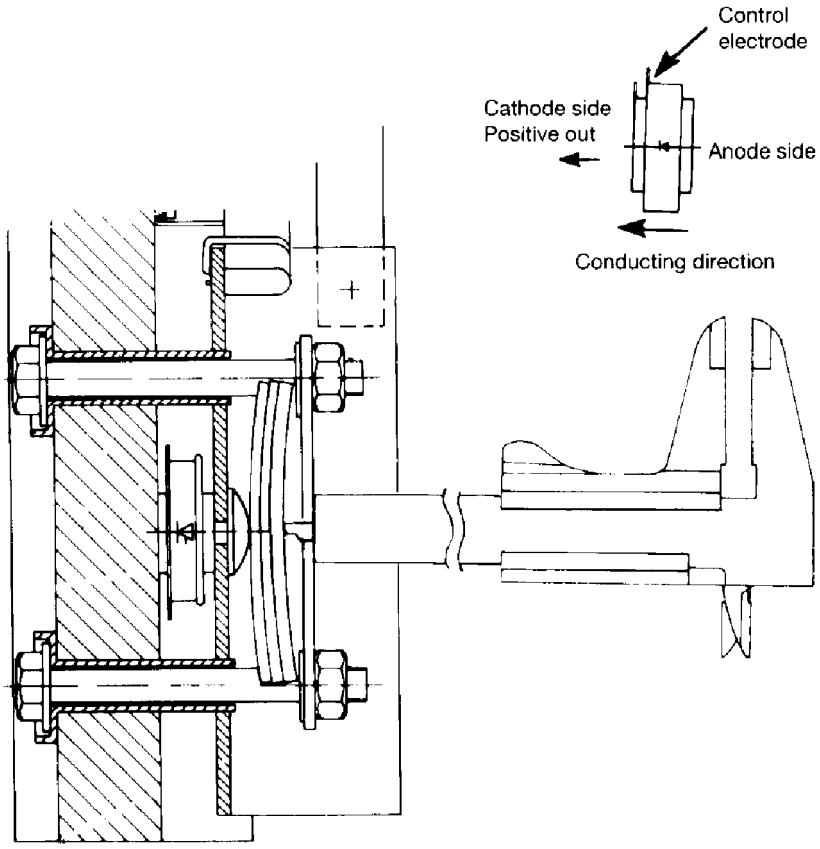
REPLACEMENT OF THYRISTORS

When fitting replacement thyristors, it is extremely important that they are correctly secured, i.e. with a clamping force of 4500 N (450 kp) ±10%.

Clean the flat surfaces of the thyristors and heat sinks carefully, and remove any burrs or traces of grease or oil. Apply a very thin film of silicone grease to the contact surfaces of the heat sink, and position the thyristor between the surfaces with the symbol on the thyristor facing in the direction as shown in the diagram below. Centre the thyristor by locating the pin projecting from the pressure cap in the depression in the thyristor body.

Start by finger-tightening the nuts enough to remove play between the nuts and washers. Then, using a dial gauge or depth gauge, measure the distance from the plate to the spring as shown in the diagram below. Tighten the nuts alternately with a spanner until the distance has decreased by 0,9 ±0,05mm.

FITTING OF THYRISTORS



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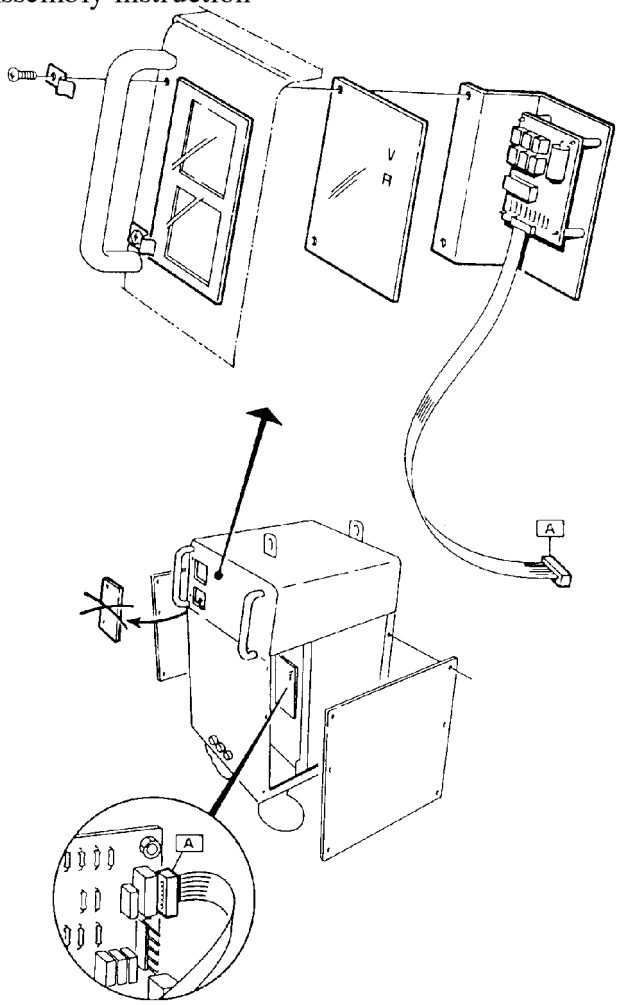
INSTRUMENTSET DIGITAL 0368 123 884

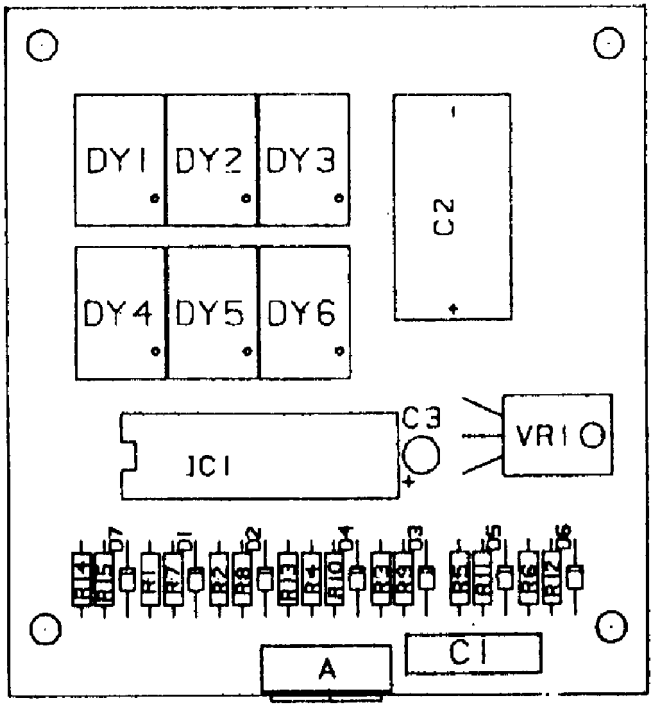
Option

Assembly instruction



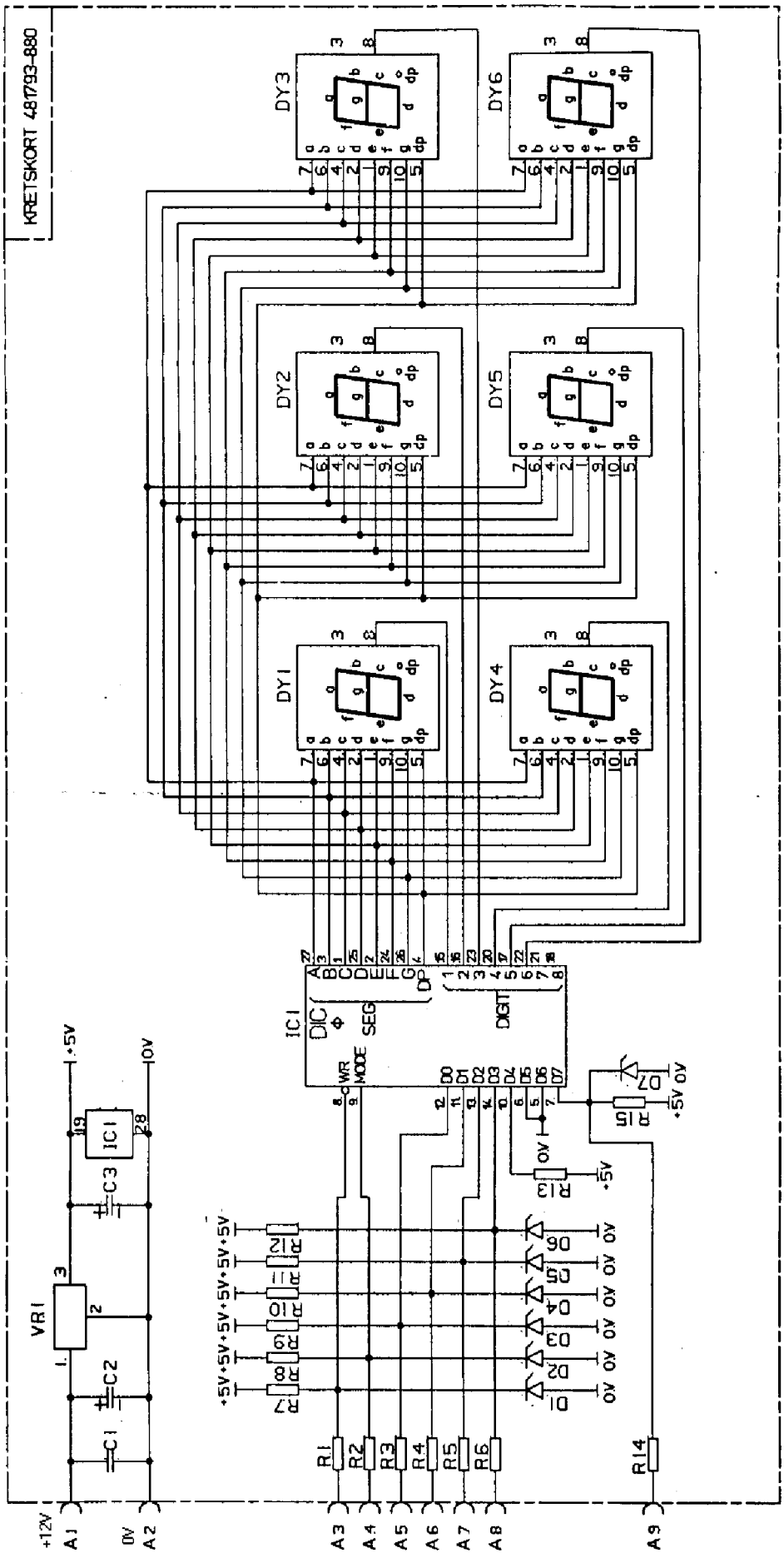
DISPLAY BOARD

Component positions



cmva6e09

CIRCUIT DIAGRAM, DISPLAY BOARD

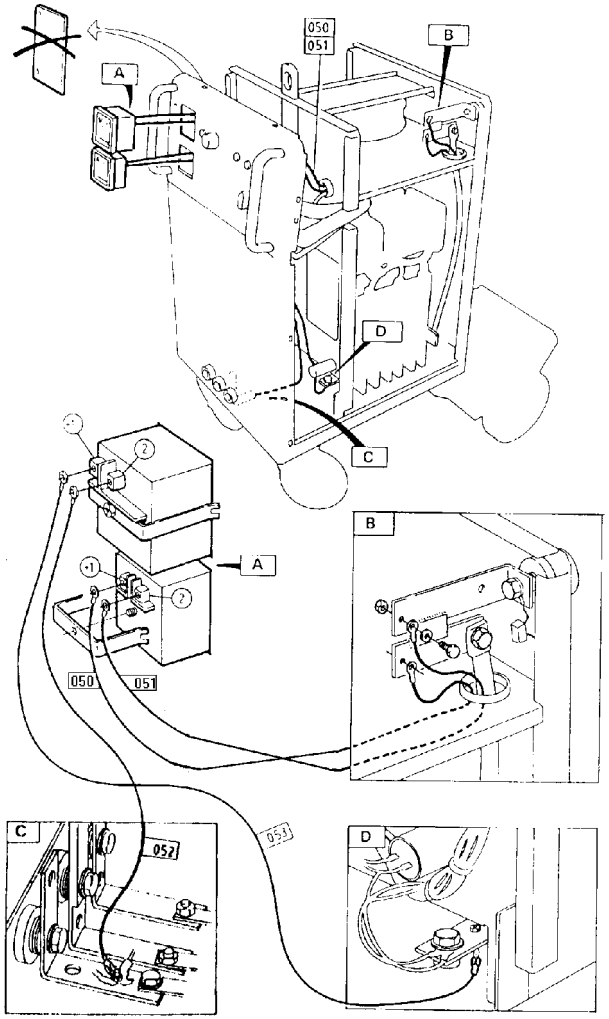


cmva6e10

INSTRUMENT SET ANALOG 0319 429 882

Option

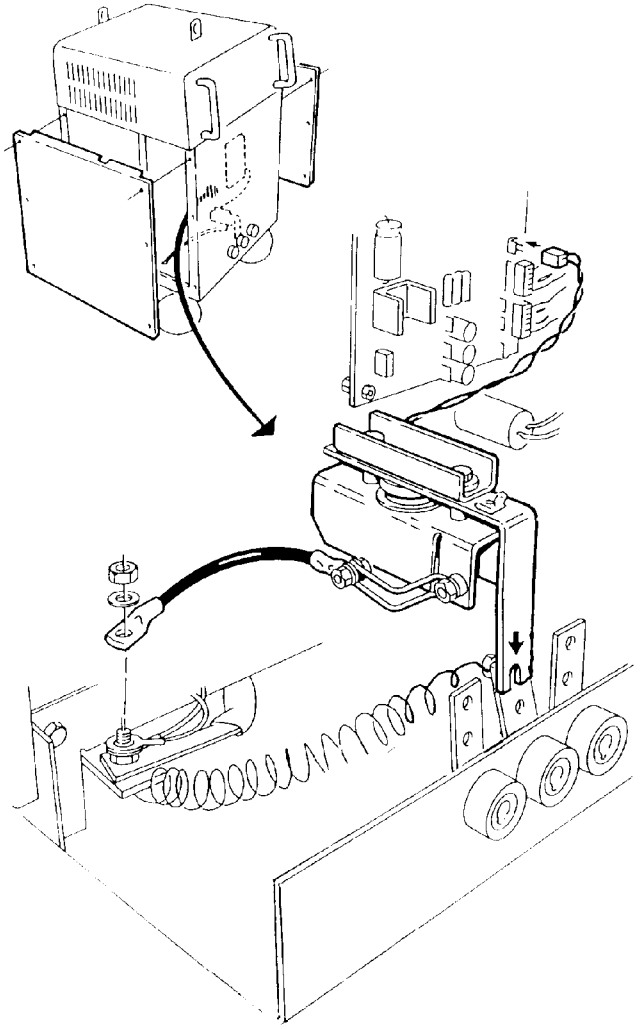
Assembly instruction



INDUCTOR SHORT-CIRCUITER 0468 122 880

Option

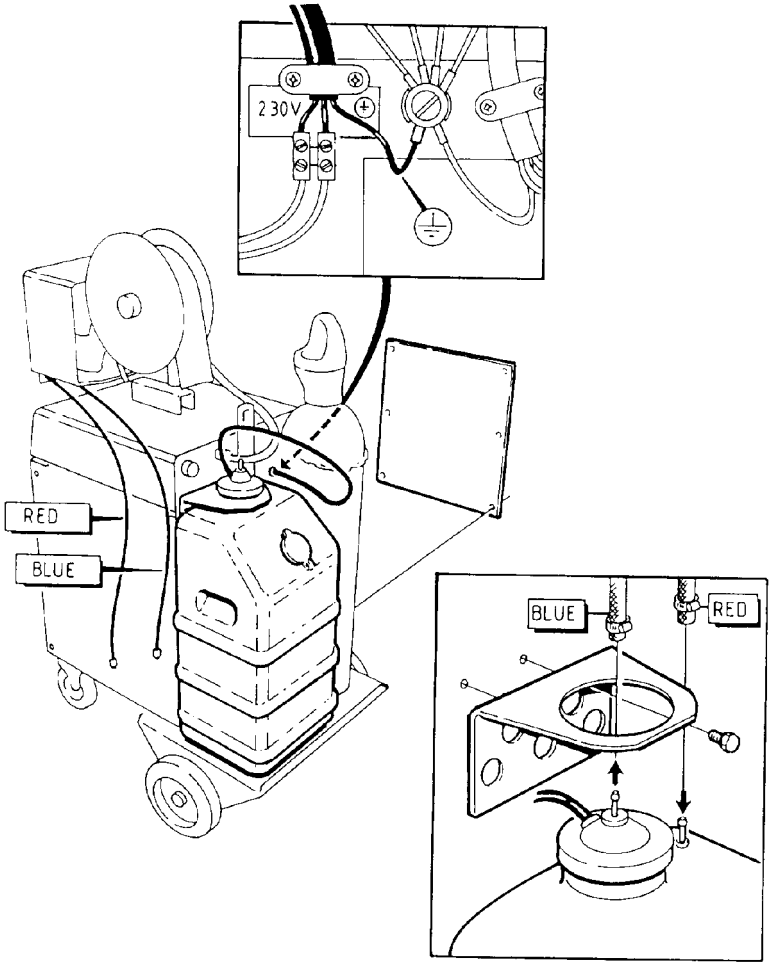
Assembly instruction



COOLING UNIT

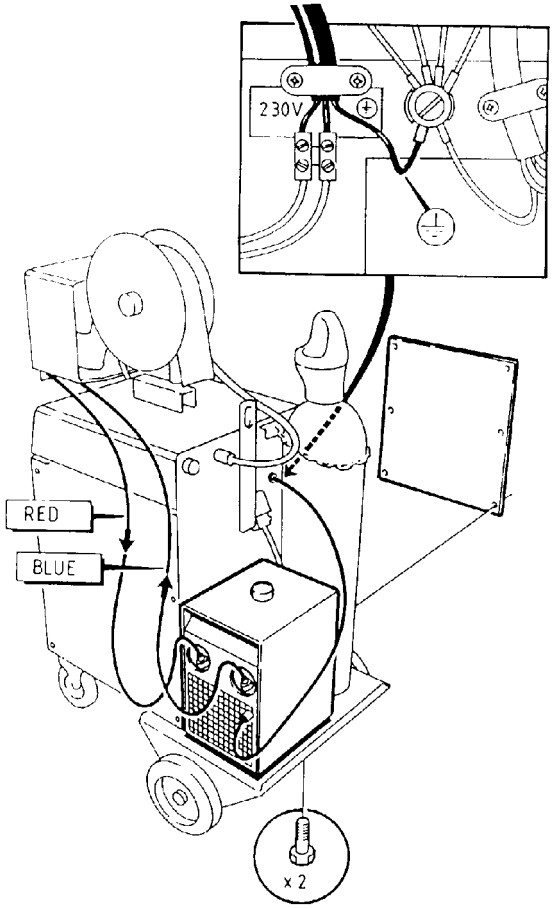
OCD-1 0156 820 880, option

Assembly instruction



OCE 2H 0414 191 881, option

Assembly instruction



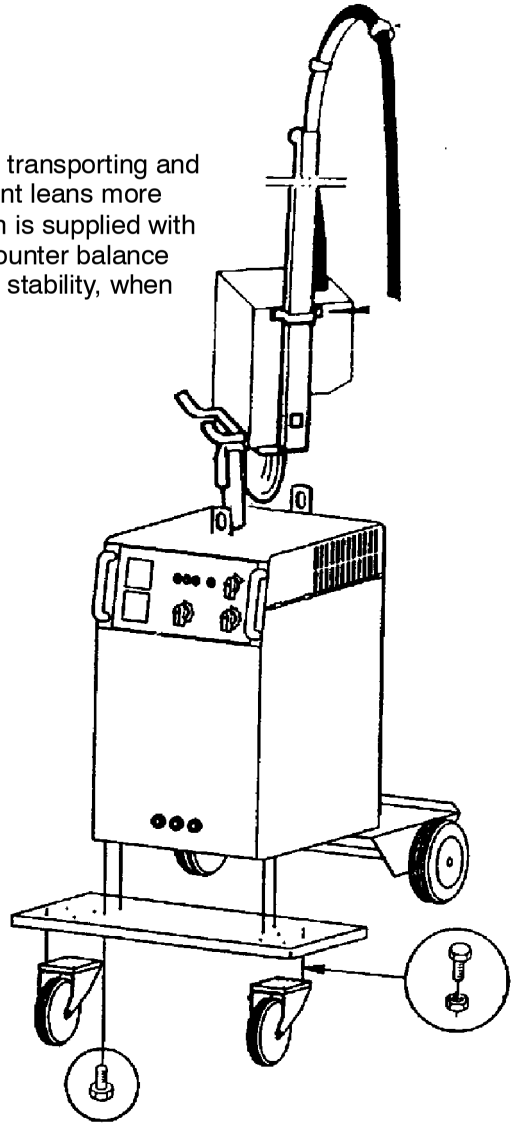
STABILIZER 0468 402 001

Option

Assembly instruction

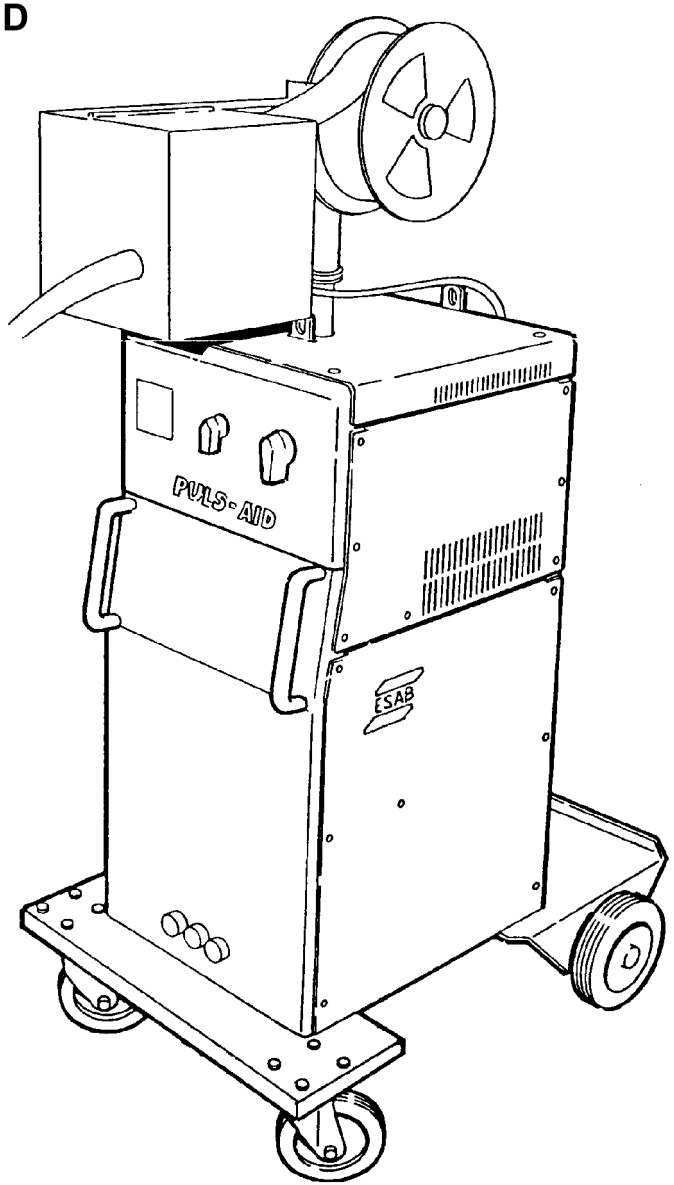
NOTE

There is a risk of tipping while transporting and storing if the welding equipment leans more than 10°. The stabilizer, which is supplied with Feed Selector, Pulse Aid or counter balance must be fitted, to increase the stability, when those options are mounted.



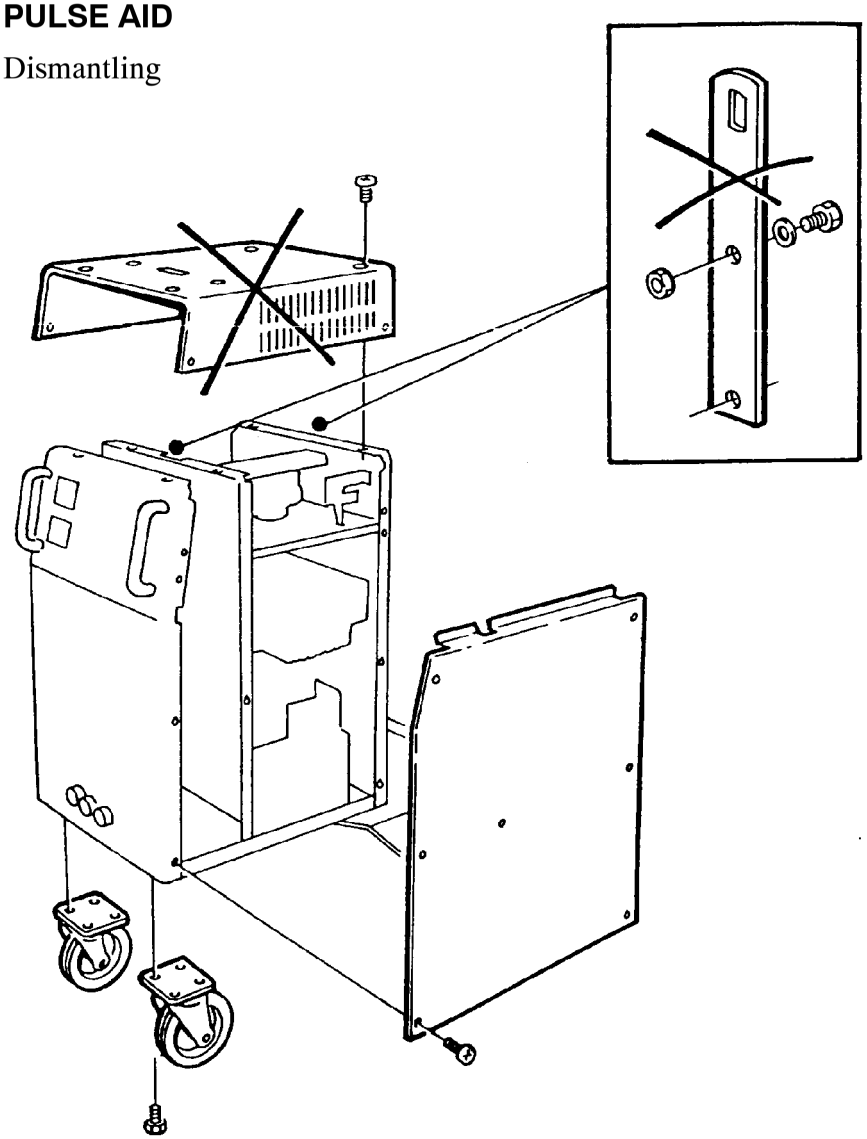
PULSE AID

Option



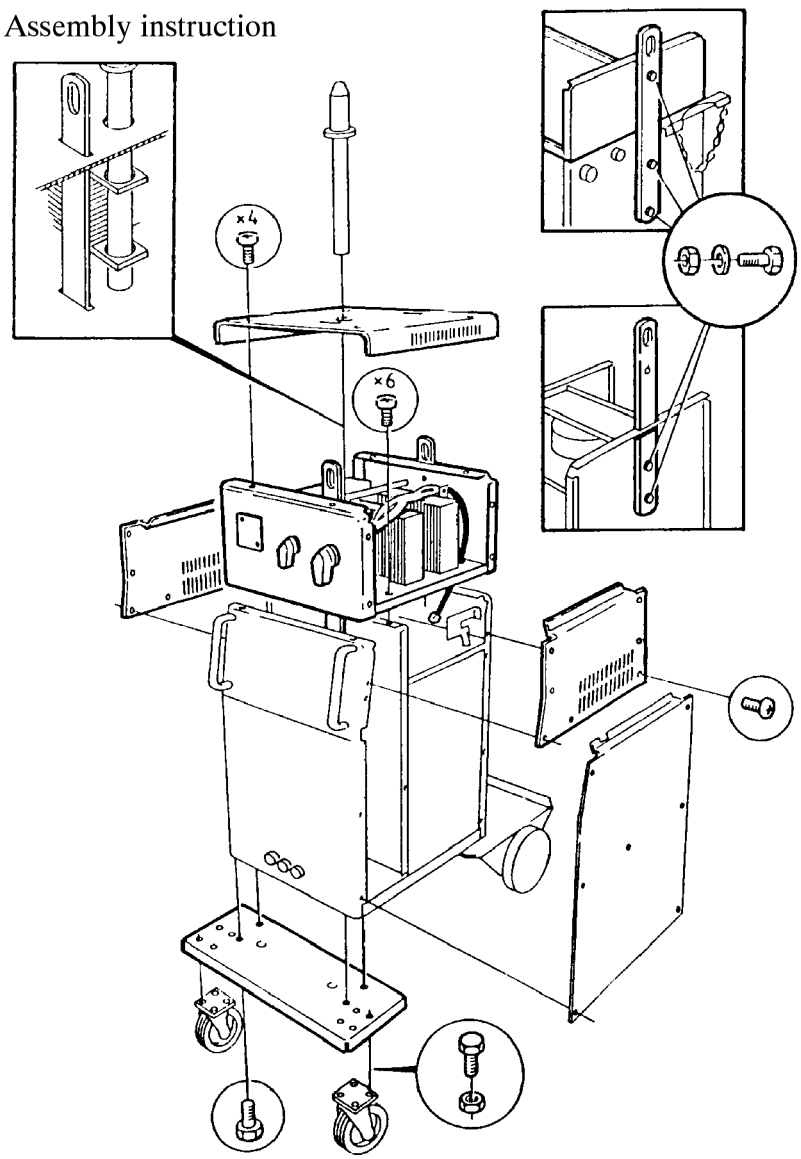
PULSE AID

Dismantling

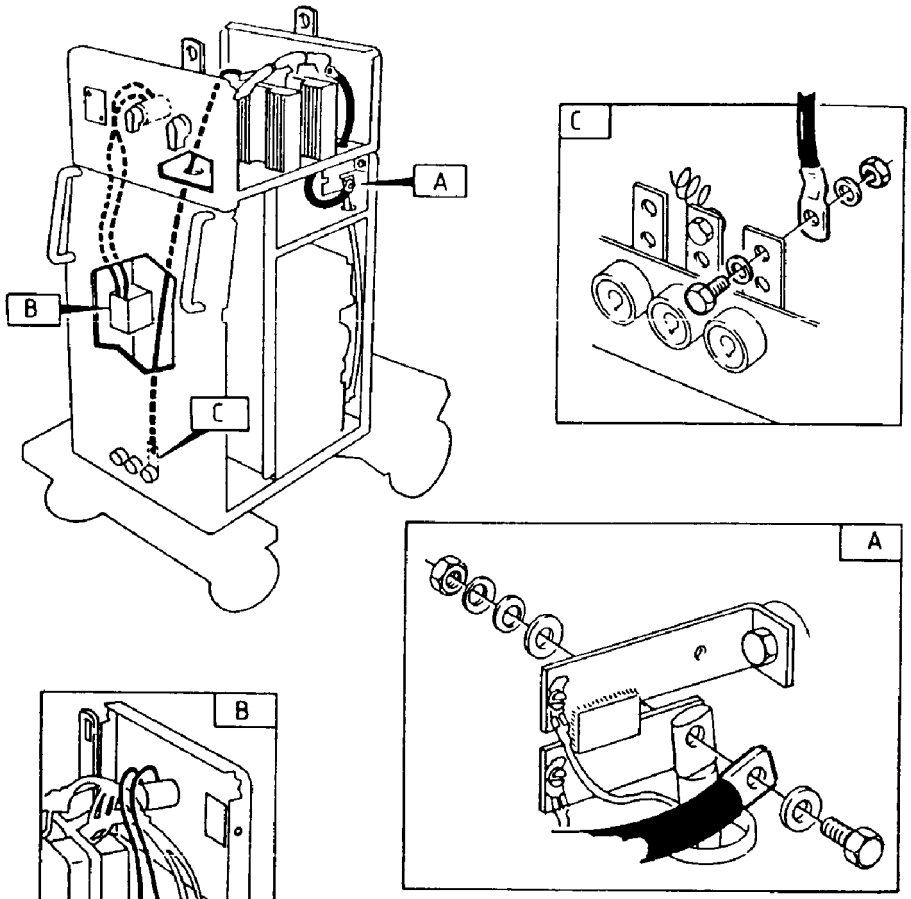


PULSE AID

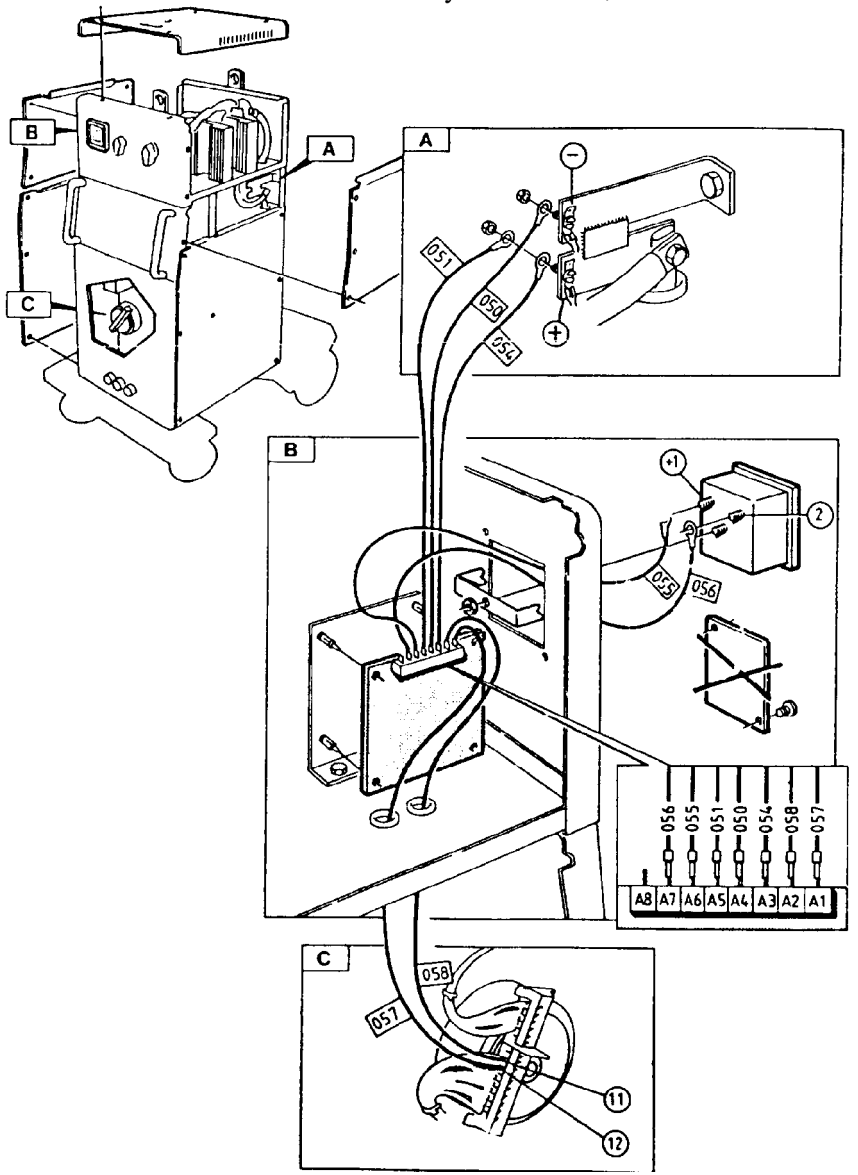
Assembly instruction



PULSE AID Connection instruction

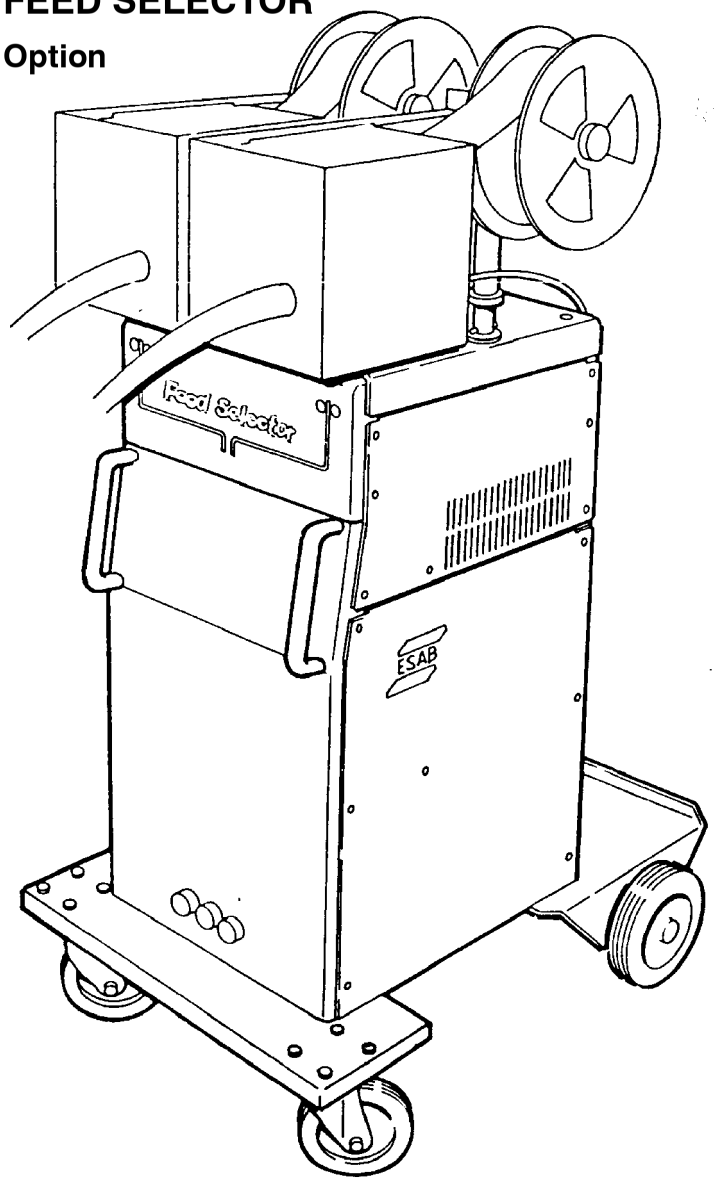


PULSE AID Assembly instruction, instrument set



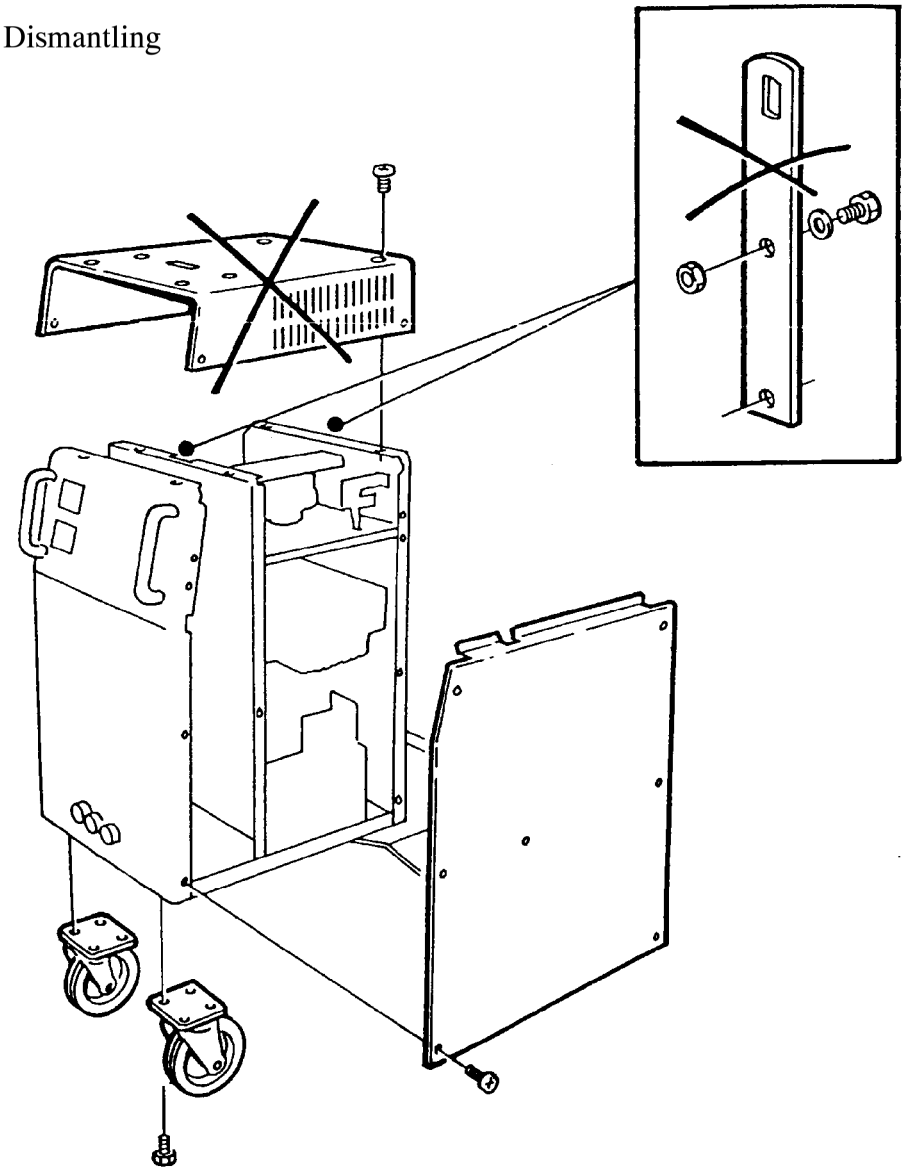
FEED SELECTOR

Option



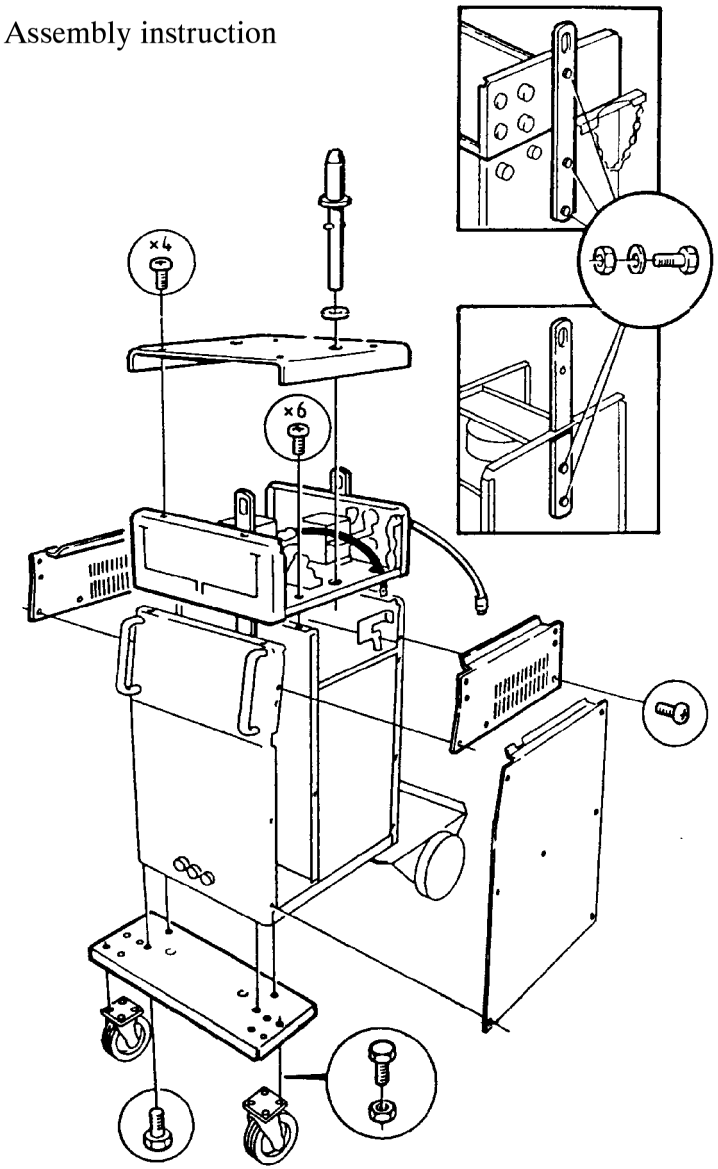
FEED SELECTOR

Dismantling



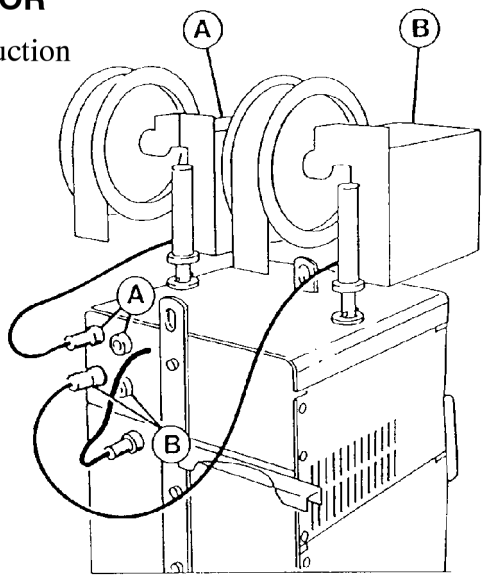
FEED SELECTOR

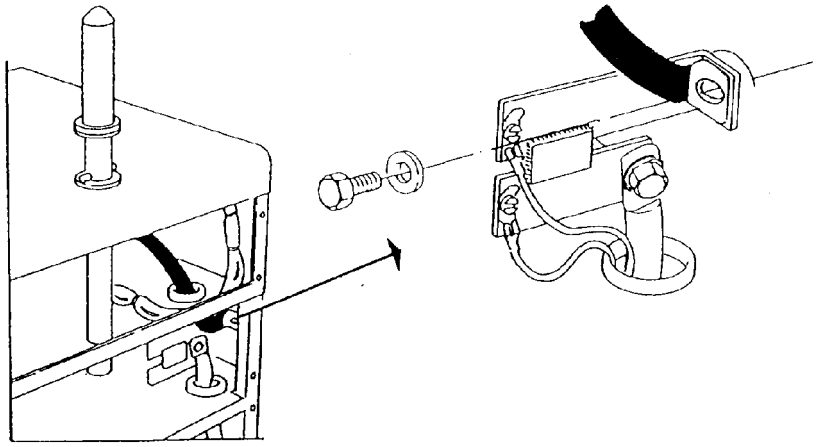
Assembly instruction



FEED SELECTOR

Connection instruction





INSTRUCTIONS

This chapter is an extract from the instructions for the LAR 500 and LAR 630.

Technical data

	LAR 630	LAR 500
Permissible load		
at 60 % duty cycle	500A/39V	630A/44V
at 80 % duty cycle	450A/35V	560A/42V
at 100 % duty cycle	400A/34V	500A/39V
Current setting range		
MIG/MAG	75A/18V–500A/39V	75A/18V–630A/44V
MMA*	40A/21V–450A/38V	40A/21V–500A/40V
Max open circuit voltage		
MIG/MAG	18–49V	18–55V
MMA*	49V	55V
Efficiency at max current		
MIG/MAG	79%	81%
MMA*	76%	80%
Power factor at max current		
MIG/MAG	0.91	0.92
MMA*	0.85	0.84
Control voltage	42V, 50/60 Hz	42V, 50/60 Hz
Enclosure class	IP 23	IP 23
Application class	S	S
Weight	210 kg	230 kg
Dimensions lxwxh	856x708x990 mm	856x708x990 mm

***** Only LAR 500/630 Magma

The welding power sources complies with the requirements of IEC 974–1

Duty cycle

The duty cycle refers to the time as a percentage of a ten–minute period that you can weld at a certain load without overloading.

Application class

The symbol S indicates that the power source is designed for use in areas with increased electrical hazard.

Enclosure class

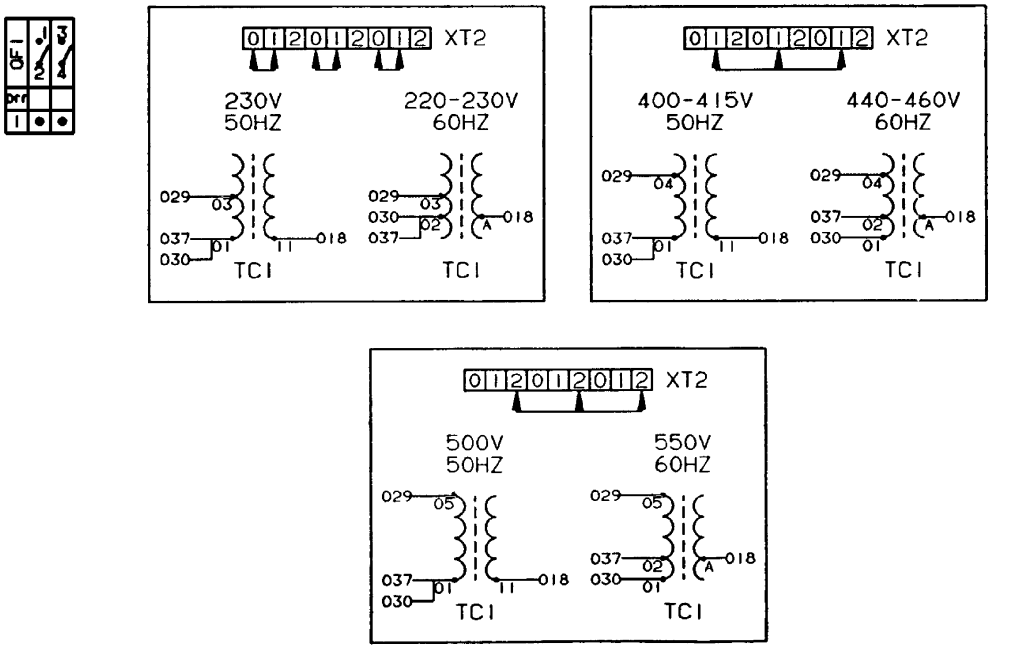
The **IP** code indicates the enclosure class, i. e. the degree of protection against penetration by solid objects or water. Equipment marked **IP 23** is designed for indoor and outdoor use.

Mains connection

		LAR 500						LAR 630					
		3~ 50 Hz			3~ 60 Hz			3~ 50 Hz			3~ 60 Hz		
Voltage (V)		230	400	500	230	440	550	230	400	500	230	440	550
Current (A)	60% 80% 100%	66 60 53	38 34 31	31 28 25	66 60 53	38 34 31	31 28 25	93 83 74	54 48 43	43 38 34	92 83 74	54 48 43	43 38 34
Fuse, slow-blow (A)		63	35	35	63	35	35	80	50	50	80	50	50
Cable area (mm^2)		4x16	4x10	4x6	4x16	4x6	4x6	4x25	4x10	4x10	4x25	4x10	4x10
Fuse, fast (A)		63	50	35	63	50	35	80	63	63	80	63	63
Cable area (mm^2)		4x16	4x10	4x6	4x16	4x10	4x6	4x25	4x16	4x16	4x25	4x16	4x16

Recommended fuses and cable areas comply with Swedish norms for rubber and plastic insulated cables.

Connection instructions



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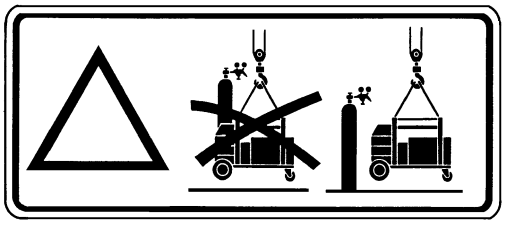
Installation

Lifting instructions

The power supply should be lifted by means of its lifting eye. The handle is only intended for pulling it along the ground.



1. Choose a suitable position for the equipment so that cooling is not obstructed, and where excessive quantities of dust, moist air or corrosive fumes cannot be sucked in, and so that the cooling air discharge does not interfere with the shielding gas around the welding head.
2. Check that the connections on the main transformer terminal and on the control power transformer, are arranged for the appropriate supply voltage, and that the correct fuses are fitted. See the connection instructions on page 50.
   The recommended fuse ratings are in accordance with Swedish standard requirements. If requirements differ in other countries, the appropriate fuses should be fitted.
3. Connect the unit to a three-phase power supply. Connect an earth lead in accordance with applicable standards to the earthing bolt marked ⏚ on the plate in front of the mains terminal.
4. Connect the control cable from the welding power source to the wire feed unit.
5. Connect the welding current cable from the wire feed unit to the terminal marked **+**. Connect the return current cable from the workpiece to one of the terminals marked **-**. Note that reversed polarity connections may be called for, depending on the type of welding electrode used.
   - Terminal A
     is used for short arc welding (thin materials or bottom runs, and for aluminium)
   - Terminal B
     is used for short arc welding, but gives a somewhat hotter weld than terminal A
   - Terminal C
     is used for spray arc welding of thick materials. Check that all welding current cables are securely connected to their respective terminals.
6. Connect the cooling unit if used.

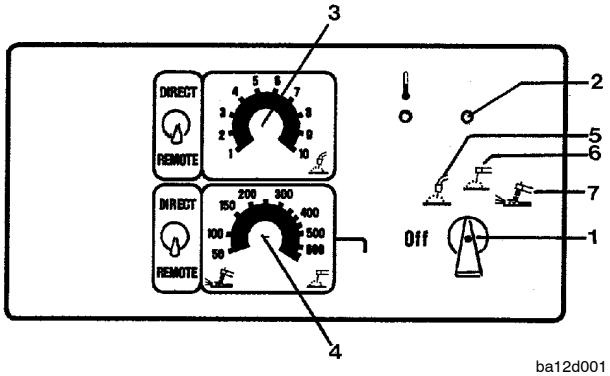
NOTE!

There is a risk of tipping while transporting and storing if the welding equipment leans more than 10°. Note that the stabiliser (which is supplied with the unit) must be fitted to increase the stability, i.e. when Feed Selector, Puls-Aid or counter balance are used). Fitting is carried out according to the enclosed fitting instructions.

Operation

Semi-automatic welding

1. Use the recommended shielding gas.
2. Set the switch (1) to the semi-automatic welding position (5). The fan will start and the indicator lamp (2) will light.
3. Press the trigger on the welding gun. The power source relay will close at the same time as the wire feed unit starts and the gas valve opens. The gas flow can be adjusted; recommended rate (10-18 l/min depending on application.) When adjusting the gas flow you should release the feed roller pressure arm to prevent wire being fed through unnecessarily.
4. Set the required welding voltage using the potentiometer (3) on the front panel of the power source and set the required wire feed speed using the potentiometer on the front of the wire feed unit.



LAR 500/630 Magma

Manual welding (MMA)

1. Set the switch (1) to the manual welding position (6). The control transformer will be energised. The fan will start and the indicator lamp (2) will light. The welding current is continuously variable (4).
2. Connect the welding cable to **+** or **-C**, depending on the type of electrode, and the return cable to **-C** or **+**.
3. Insert and electrode in the electrode holder. You can now start welding.

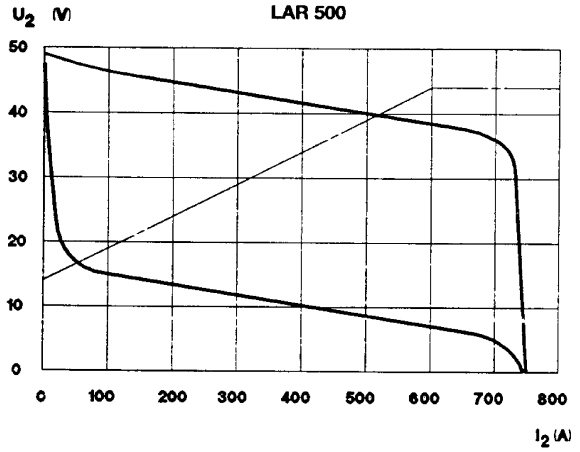
Arc-air gouging

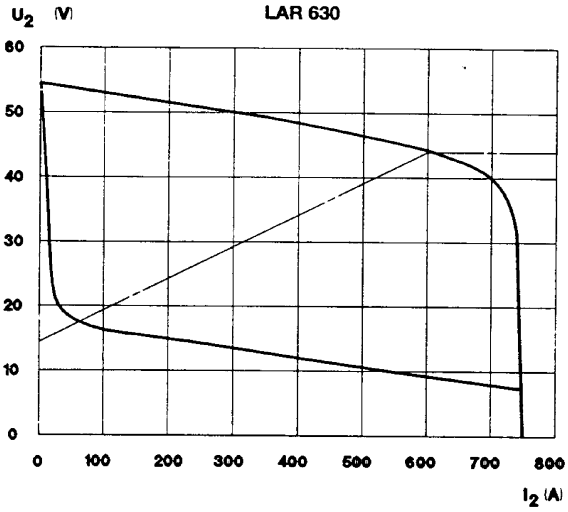
1. Set the switch (1) to the arc-air gouging position (7). The control transformer will be energised. The fan will start, the relay will close and indicator lamp (2) will light. The welding current is continuously variable (4).
2. Connect the gouge to **+** and the return cable to **-A**
3. Fit a carbon rod to the gouge. You can now start gouging.

Maintenance

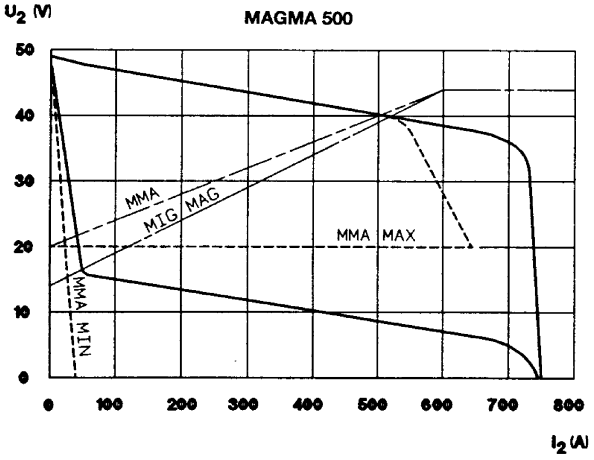
Once a year, blow the power source clean using dry compressed air at reduced pressure. The power source should be cleaned more frequently if used in a very dusty or dirty environment.

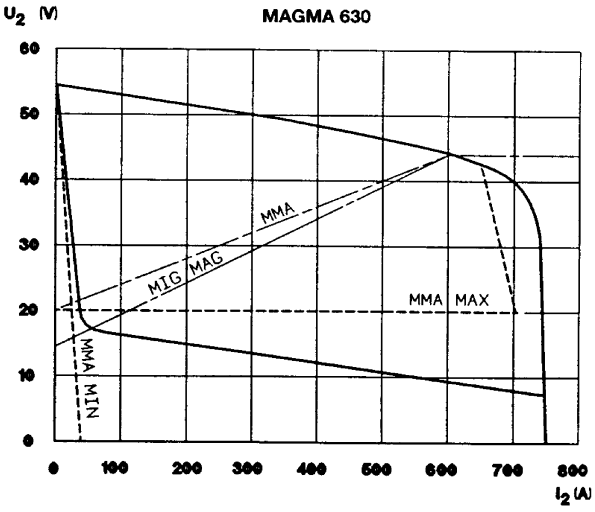
Static characteristic





Primary 3 ~ 50 Hz, 400 V



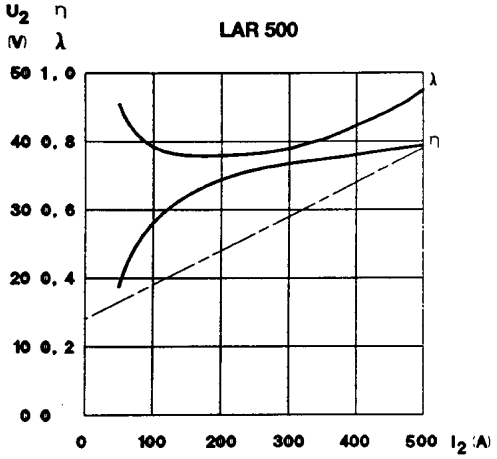


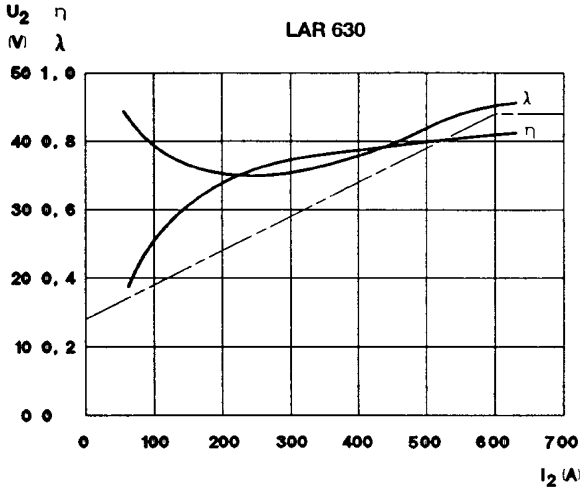
——— Position MIG/MAG MAX resp. MIN

- - - - Einstellung MMA MAX bzw. MIN

——·—— Standardized load voltage acording to IEC 974

Efficiency and power factor



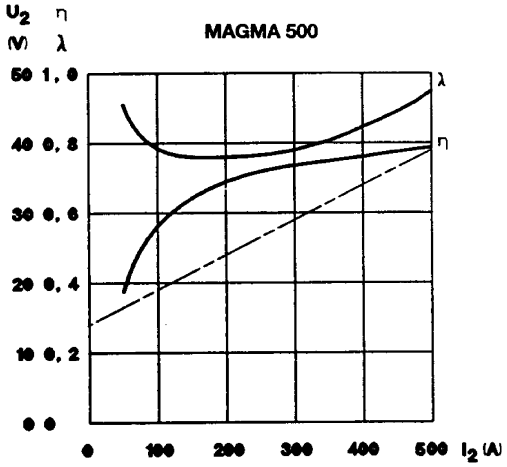


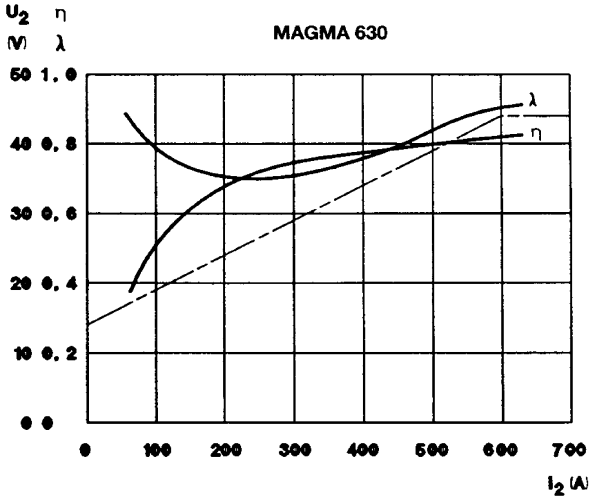
—— —— Inductance C

— — — — Inductance A

———— Standardized load voltage acc. to VDE 0542 and NF A85-013

Primary 3 ~ 50 Hz, 400 V



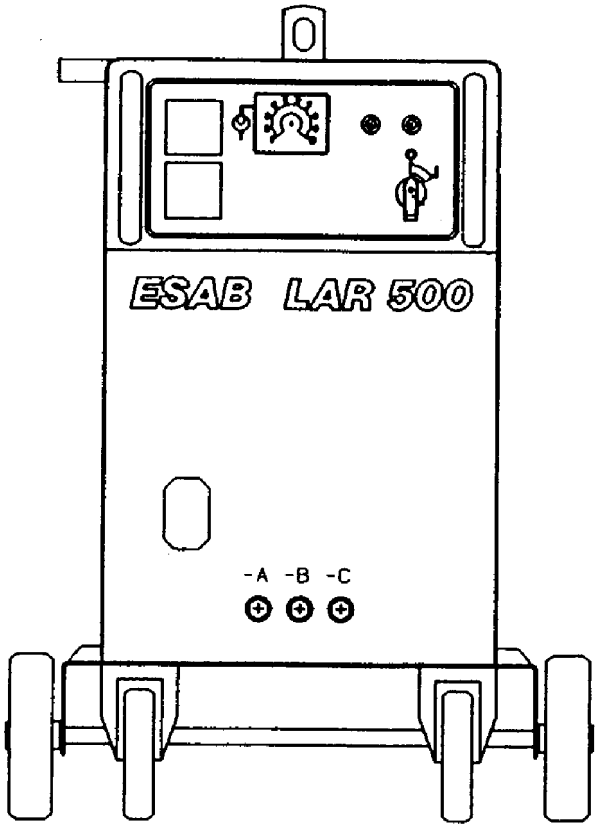


—·— Standardized load voltage acording to IEC 974

Extra accessories

For remote control of welding parameters:	Ordering no.
PHB 1 fitted with planetary-geared multi-turn potentiometer for exact adjustment	0367 317 880
PHB 2 fitted with coarse and fine adjustment potentiometers	0367 318 880
PAB 6 Three arbitrary current and voltage combinations can be preset and selected by a 3-position switch	0367 308 880
PAE 2 Remote control for current and voltage PAE 2 is equipped with planetary gearing for accurate setting. Available in two designs:	
PAE 2 (Box) incl. 5 m cable	0467 277 880
PAE 2 (Bar) incl. 5 m cable	0466 515 882
PAE 4 Programming device for 5 different sets of welding data which are selected via a switch on the front panel. Supplied with 5 m of connecting cable	0368 920 880
Feed Selector Expansion unit for use with double feed units.	0468 040 880
Pulse Aid Pulse unit for aluminium welding	
400/500 V with operating level meter	0467 570 880
400/500 V without operating level meter	0467 570 881
230 V without operating level meter	0467 570 882
Digital meter set	0368 123 884
Analogue meter set	0319 429 882

Spare parts list



cmva2pbg

Valid for serial no. 024-xxx-xxxx to serial no. 535-xxx-xxxx

Ordering numbers for *LAR 500/630, LAR 500/630 Magma*

0467 975 880	LAR 500
0467 975 881	LAR 500 Magma
0467 976 880	LAR 630
0467 976 881	LAR 630 Magma

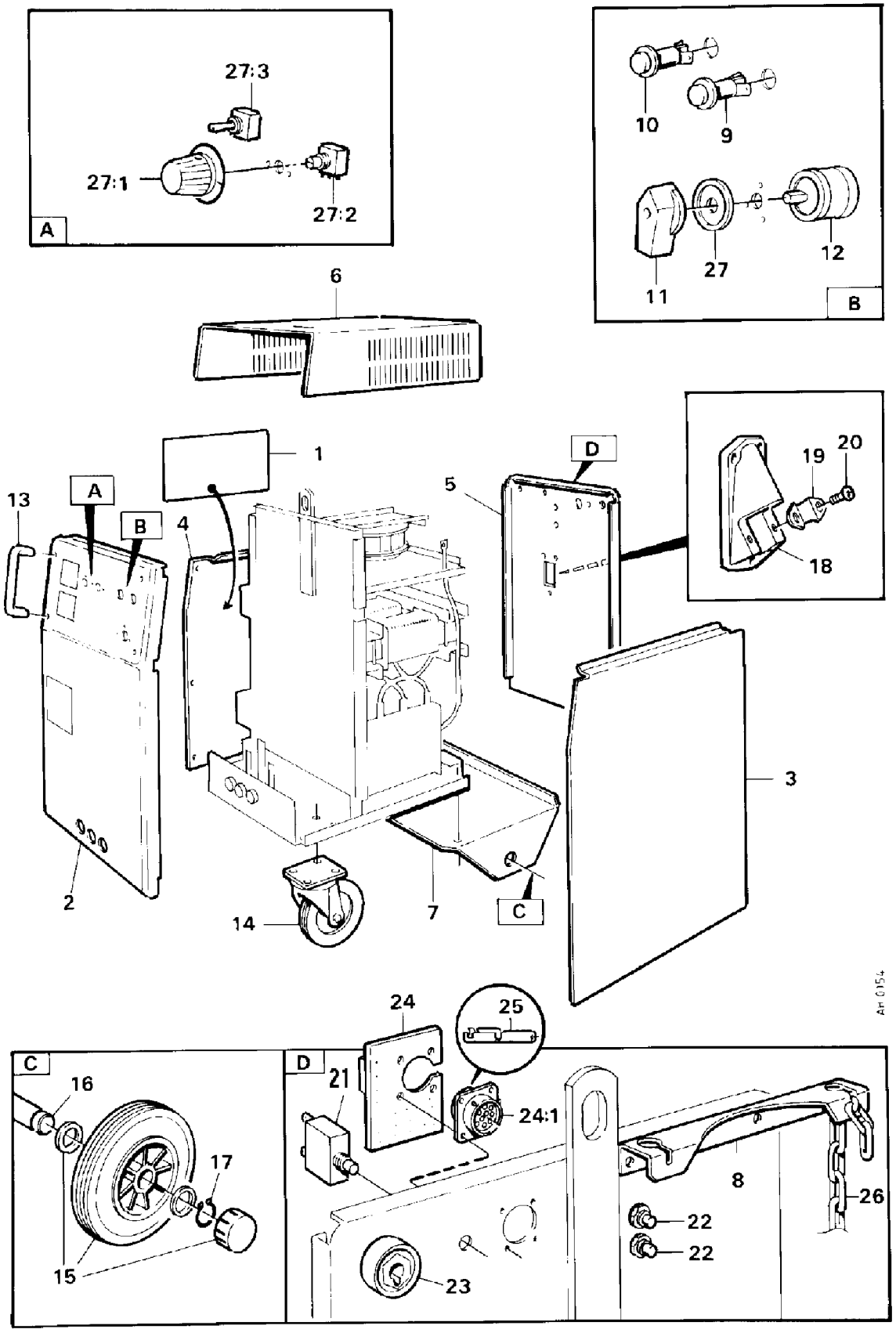
Spare parts are to be ordered through the nearest ESAB agency as per the list on the back of the cover. Kindly indicate type of unit, serial number, denominations and ordering numbers according to the spare parts list.

Maintenance and repair work should be performed by an experienced person, and electrical work only by a trained electrician. Use only recommended spare parts.

C = component designation in the circuit diagram

500 = LAR 500 500M = LAR 500 Magma 630 = LAR 630 630M = LAR 630 Magma

Item no.	Qty 500	Qty 500M	Qty 630	Qty 630M	Ordering no.	Denomination	Notes	C
1						Wiring diagram		
2	1	-	-	-	0466 780 001	Front panel		
	-	1	-	-	0467 120 001	Front panel		
	-	-	1	-	0466 781 001	Front panel		
	-	-	-	1	0467 121 001	Front panel		
3	1	1	-	-	0467 003 001	Side panel		
	-	-	1	1	0467 004 001	Side panel		
4	1	1	-	-	0467 003 002	Side panel		
	-	-	1	1	0467 004 002	Side panel		
5	1	1	1	1	0467 788 001	Rear panel		
6	1	1	1	1	0466 899 001	Cover plate		
7	1	1	1	1	0468 263 001	Platform	(Replacing 0369 839 001)	
	1	1	1	1	0468 262 001	Bracket	For the platform	
8	1	1	1	1	0318 170 001	Support		
9	1	1	1	1	0192 576 004	Indicating lamp	42 - 48 V, white	HL1
10	1	1	1	1	0192 576 304	Indicating lamp	42 - 48 V, yellow	HL2
11	3	3	3	3	0318 113 003	Knob		
12	1	-	1	-	0320 746 001	Mains switch		QF1
	-	1	-	1	0366 872 001	Mains switch		QF1
13	2	2	2	2	0467 176 001	Handle		
14	2	2	2	2	0159 932 004	Castor wheel		
15	2	2	2	2	0229 206 401	Wheel, washer, capsule		
16	1	1	1	1	0319 362 001	Axle		
17	2	2	2	2	0215 701 016	Retaining ring		
18	1	1	1	1	0158 117 880	Cable inlet		
19	1	1	1	1	0216 610 501	Clamp		
20	2	2	2	2	0193 189 333	Screw	MRX M5x25	
21	1	1	1	1	0193 586 102	Fuse	Miniature circuit-breaker, 10 A	FU1
22	2	2	2	2	0193 586 101	Fuse	Miniature circuit-breaker, 5 A	FU2, FU3
23	4	4	4	4	0160 362 881	Welding current terminal	OKC	XS2 - XS5
24	1	1	1	1	0481 195 882	Circuit board		AP2
24:1	1	1	1	1	0368 544 005	Sleeve socket		XS1
25	10	10	10	10	0193 513 105	Contact sleeve		
26	1	1	1	1	0321 173 001	Chain	L = 700 mm	
27	3	3	3	3	0320 781 001	Escutcheon plate		
27:1	1	2	1	2	0467 018 001	Knob	With planetary gear	
27:2	1	2	1	2	0191 870 512	Potentiometer		RP1, RP2
27:3	1	2	1	2	0147 866 001	Toggle switch		SA1, SA2



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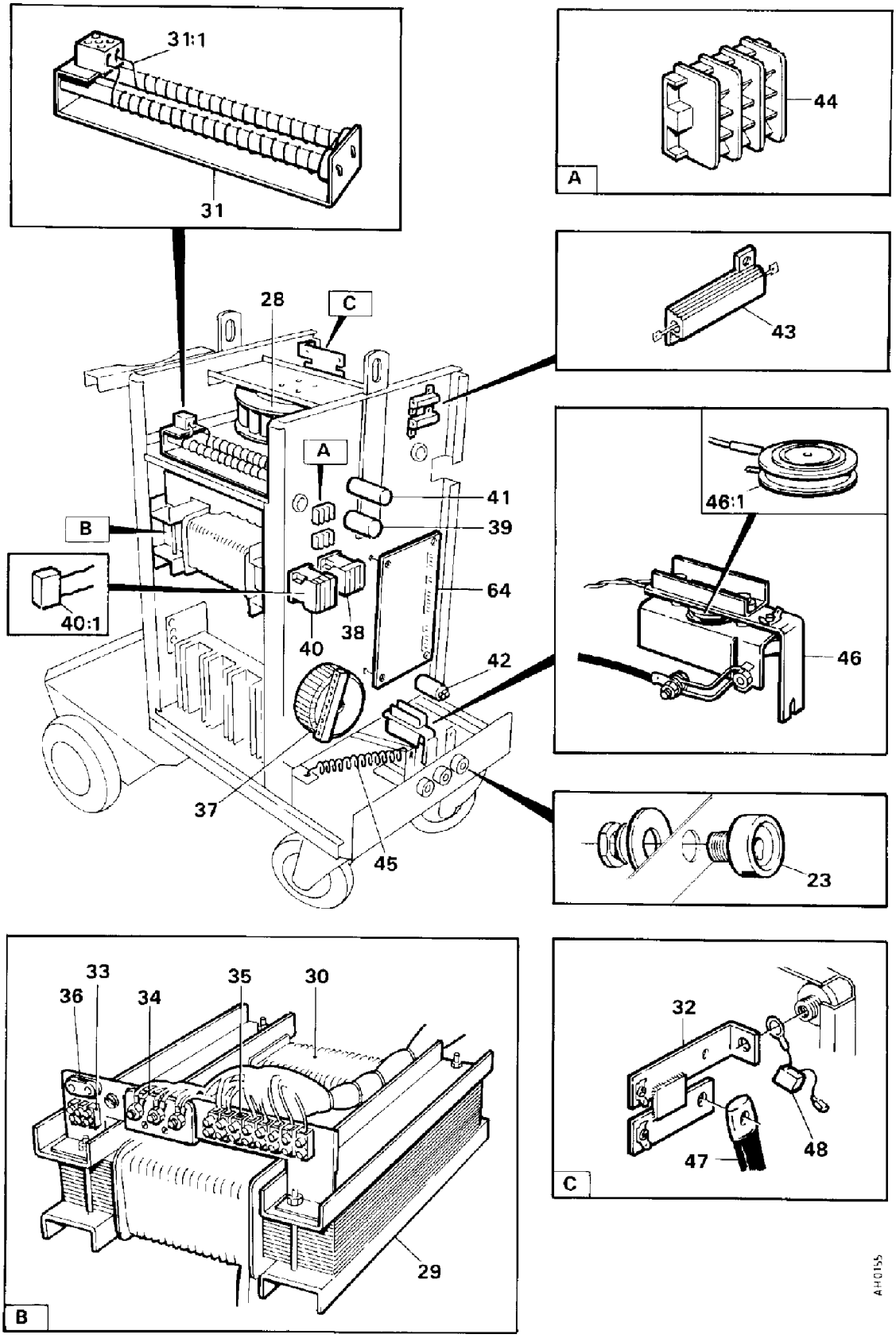
cmva2se1

C = component designation in the circuit diagram

500 = LAR 500 500M = LAR 500 Magma 630 = LAR 630 630M = LAR 630 Magma

Item no.	Qty 500	Qty 500M	Qty 630	Qty 630M	Ordering no.	Denomination	Notes	C
28	1	1	1	1	0369 827 001	Fan		M1
29	1	1	-	-	0467 970 880	Transformer	Complete	TM1
	-	-	1	1	0467 970 881	Transformer	Complete	TM1
30	3	3	-	-	0467 968 880	Transformer coil		
	-	-	3	3	0467 969 880	Transformer coil		
31	1	1	1	1	0321 003 880	Resistor	1.1Ω	R4
32	1	-	1	-	0467 992 881	Shunt		RS1
	-	1	-	1	0467 119 880	Shunt		RS1
33	1	1	1	1	0193 045 002	Terminal block	3 pole	XT3
34	1	1	1	1	0162 772 001	Terminal block	3 pole	XT1
35	1	1	1	1	0320 378 008	Terminal block	9 pole	XT2
36	2	2	2	2	0162 781 901	Load relieving clamp		
37	1	1	1	1	0467 973 001	Control transformer		TC1
38	1	1	1	1	0193 296 101	Contactor	42 V	KM2
39	1	1	1	1	0191 085 203	Capacitor		C1
40	1	1	1	1	0193 503 101	Contactor	42 V	KM1
40:1	1	1	1	1	0041 051 601	Filter	0.5 μF 220 Ω	Z2
41	1	1	1	1	0191 603 204	Capacitor		C5
42	1	1	1	1	0046 006 704	Capacitor	1 μF 400 V	C2
43	2	2	2	2	0192 579 226	Resistor	100 Ω 50 W	R1, R2
44	2	2	2	2	0466 884 003	Terminal block	3 pole	XT4, XT5
45	1	1	1	1	0467 169 002	Resistor	0.7 Ω	R3
46	1	1	1	1	0468 122 880	Inductor short-circuiter		V7
46:1	1	1	1	1	0320 028 002	Thyristor		
47	1	1	-	-	0467 910 880	Cable set		
	-	-	1	1	0467 910 881	Cable set		
48	1	1	1	1	0467 911 881	Capacitor	0.1 μF 400 V	C3
64	1	1	1	1	0481 593 884	Circuit board		AP1



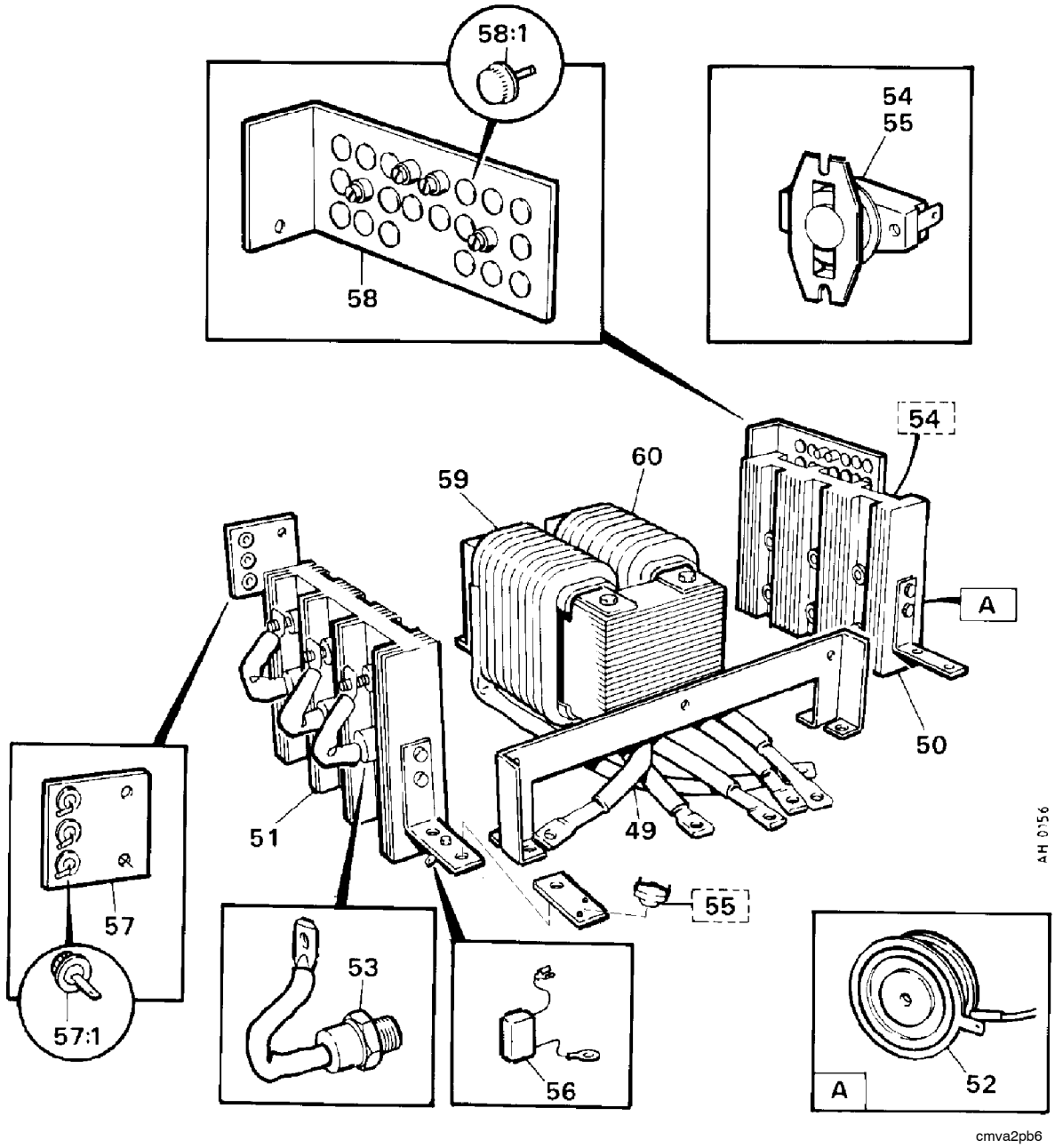
cmva2pb5

cmva2se1

C = component designation in the circuit diagram

500 = LAR 500 500M = LAR 500 Magma 630 = LAR 630 630M = LAR 630 Magma

Item no.	Qty 500	Qty 500M	Qty 630	Qty 630M	Ordering no.	Denomination	Notes	C
49	1	1	-	-	0469 255 881	Inductor	Complete	L1
	-	-	1	1	0469 255 886	Inductor	Complete	L1
50	1	1	-	-	0320 620 885	Thyristor bridge	Complete	V1
	-	-	1	1	0320 620 886	Thyristor bridge	Complete	V1
51	1	1	-	-	0320 767 880	Diode bridge	Complete	V2
	-	-	1	1	0320 415 880	Diode bridge	Complete	V2
52	3	3	-	-	0320 028 002	Thyristor		V1
	-	-	3	3	0318 726 001	Thyristor		V1
53	3	3	6	6	0490 600 626	Diode		V2
54	1	1	1	1	0319 445 001	Thermal cutout		ST1
55	1	1	1	1	0369 904 001	Thermostat		ST2
56	1	1	1	1	0467 911 880	Capacitor	0.1 μF 400 V	C4
57	1	1	1	1	0321 033 880	Diode bridge	Complete	V4
57:1	3	3	3	3	0321 468 003	Diode		V4
58	1	1	1	1	0320 622 881	Diode bridge	Complete	V3
58:1	18	18	18	18	0321 468 003	Diode		V3
59	1	1	-	-	0469 170 880	Inductor coil -A	Only the complete inductor can be replaced in machines older than serial no. 305-xxx-xxxx	
	-	-	1	1	0469 246 880	Inductor coil -A	Only the complete inductor can be replaced in machines older than serial no. 305-xxx-xxxx	
60	1	1	-	-	0469 171 880	Inductor coil -B -C	Only the complete inductor can be replaced in machines older than serial no. 305-xxx-xxxx	
	-	-	1	1	0469 247 880	Inductor coil -B -C	Only the complete inductor can be replaced in machines older than serial no. 305-xxx-xxxx	
-	-	1	-	1	0319 876 880	Circuit board		AP3
-	-	1	-	1	0319 828 001	Control transformer		TC2
-	-	1	-	1	0365 557 001	Elbow coupling		OKC
-	-	1	-	1	0490 600 626	Freewheel diode		V5
-	-	1	-	1	0368 544 003	Sleeve socket		XS7



cmva2pb6

cmva2se1

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